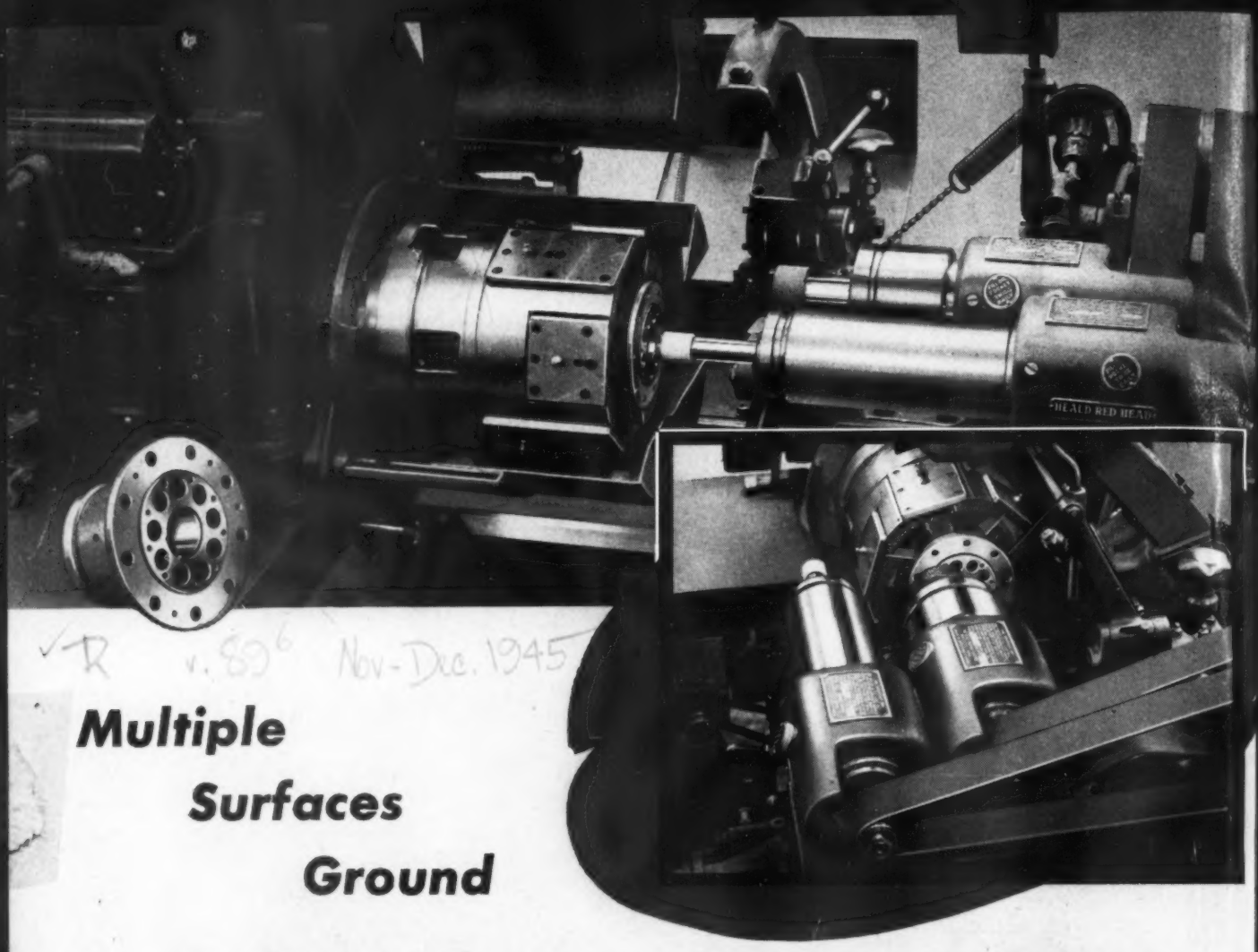
NOVEMBER 8, 1945

American Machinist

TECHNOLOGY DEPT.
DETROIT

How to Ship Surplus Equipment

ACCORDING TO GOVERNMENT RULES



R v.89 Nov-Dec. 1945

Multiple Surfaces Ground

with HEALD TWO SPINDLE INTERNAL GRINDING MACHINE

Perhaps grinding operations on one of your parts involve a hole and outside face, or two different diameter bores and an adjoining face, or a bore, external diameter and adjacent faces. All of these surfaces can be ground in just one setup, one chucking. This means perfect squareness between I.D.'s and O.D.'s and faces, close concentricity of internal and external surfaces, plus, of course, substantially bettered production and cost savings due to less handling, as well as one machine for the job instead of two or even three.

●

Take for instance the plunger housing made of nitralloy shown above. The surfaces ground on this part in a *single chucking* not only include the blind hole and the outside adjacent face but also an external rabbet. Concentricity, squareness and parallelism are maintained to .002".

●

The grinding of the hole is performed by using the front wheelhead, then the workhead cross-slide is indexed and the surface adjacent to the hole is surface ground by the rear wheelhead. The workhead cross-slide is again indexed and the outer rabbet face is finished.

●

Our engineers would be glad to check on any job you have in mind. A complete bulletin on this machine gladly sent on request.

THE HEALD MACHINE COMPANY
WORCESTER 6, MASS.

More Precision · Less Cost **HEALD**

INTERNAL AND SURFACE GRINDING MACHINES • BORE-MATIC PRECISION FINISHING MACHINES

TECHNOLOGY DEPT!

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MAJOR ARTICLES

Hot-forming Annealed Aluminum Alloys..*Sachs, Espey & Brown* 91
Shop Shots 96
Cost Reduction Aspects of Flame-Cutting....*Dr. G. V. Slottman* 98
Profile Templet With Air Follower Whips Tricky Turning Job.. 102
The German Economic Peace.....*Facing Page* 104
Extrusion Drilled From End-to-End in Box Jigs..*Conrad Mattson* 106
Factors Simplify Odd-Toothed Gear Measurements..... 108
Stacking Dies Count Laminations Automatically..... 109
Heat-Treatment Helps High-Strength Irons.... *Dr. C. R. Austin* 110
Land Survey Adapted to Shop Drawings.....*Mark W. Purser* 121

RECONVERSION SECTION

How to Ship Surplus Equipment..... 113

PRACTICAL IDEAS

Music Wire Straightened in Lathe.....*Douglas Leslie* 123
Gage for Grinding Threading Toolbits....*George B. Washowich* 123
Hinged Jig Aids Drilling and Tapping.....*Oscar M. Stiegler* 124
Testing Optical Windows for Strains.....*O. L. Altenberg* 124
Harness-Lead Clamp Tool.....*John Croce & Rico de Nadal* 124
Spring Center for Lathe Tapping.....*Albert F. Cashman* 124
Worms Cut on Miller by Geared Attachments..*Ross A. Schultz* 125
Automatic Electric Marker for Rapid Wire Cutting..*Fred Rayser* 127
Multiple Head for Closely Spaced Holes.....*Patrick J. O'Hara* 127
Hydraulic Feed Prevents Breakage of Drills....*Fred W. Kriewell* 127
Gate Permits Loading of Blanks as Lathe Turns.*Albert E. McKay* 128
Piloted Mill Improves Accuracy, Production.....*George J. Oscars* 128

NEWS OF THE INDUSTRY

Gaging Business..... 132a
Detroit Letter..... 132d
Washington Bulletin..... 132g
Labor Summary..... 132h
Names in the News..... 132k
Obituaries 132l

DEPARTMENTS

Editorial 89
Foreman's Round Table.... 105
Talking Shop..... 112
Reference Book Sheet..... 129
Shop Equipment News..... 133
Trade Publications..... 150

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American Machinist Chips

Flurry . . . Burnham Finney's editorial in the August 16 issue of *American Machinist*—"How Not to Develop Foreign Trade"—is still bringing letters of comment into the office.

One highly complimentary one was from Alex S. Keller of Pratt & Whitney—who is Chairman of the Foreign Sales Committee of the National Machine Tool Builders' Association. Several other machine tool builders have phoned to comment favorably on the editorial.

The Belgian Purchasing Commission took back with them to their country a copy of the editorial so that they might explain to their government why they had not been able to buy the American equipment they sought. The French Purchasing Commission were so enthusiastic about the editorial as being expressively of their views, that they had a photostatic copy made, framed and hung on the walls of the office of Lucian Rose, head of the Commission's Machine Tool Purchasing Division.

In This Issue . . . Cast a careful eye over this latest Reconversion Section. "How to Ship Surplus Equipment" is a digest of revised government rules for preparation of machines declared surplus and to be shipped to RFC warehouses by the former war contractor. Information is given on the skidding, shrouding and boxing of machines and their accessories . . . according to methods which differ from normal commercial practice, but which are deemed necessary by the Surplus Property Board to insure salability and maintain the "working quality" certified by government inspectors.

Behavior of aluminum alloys at elevated temperatures is discussed by three laboratory representatives of the Case School of Applied Science. The most important effect of the elevated temperature involves the lubricant, according to plant tests made by the authors.

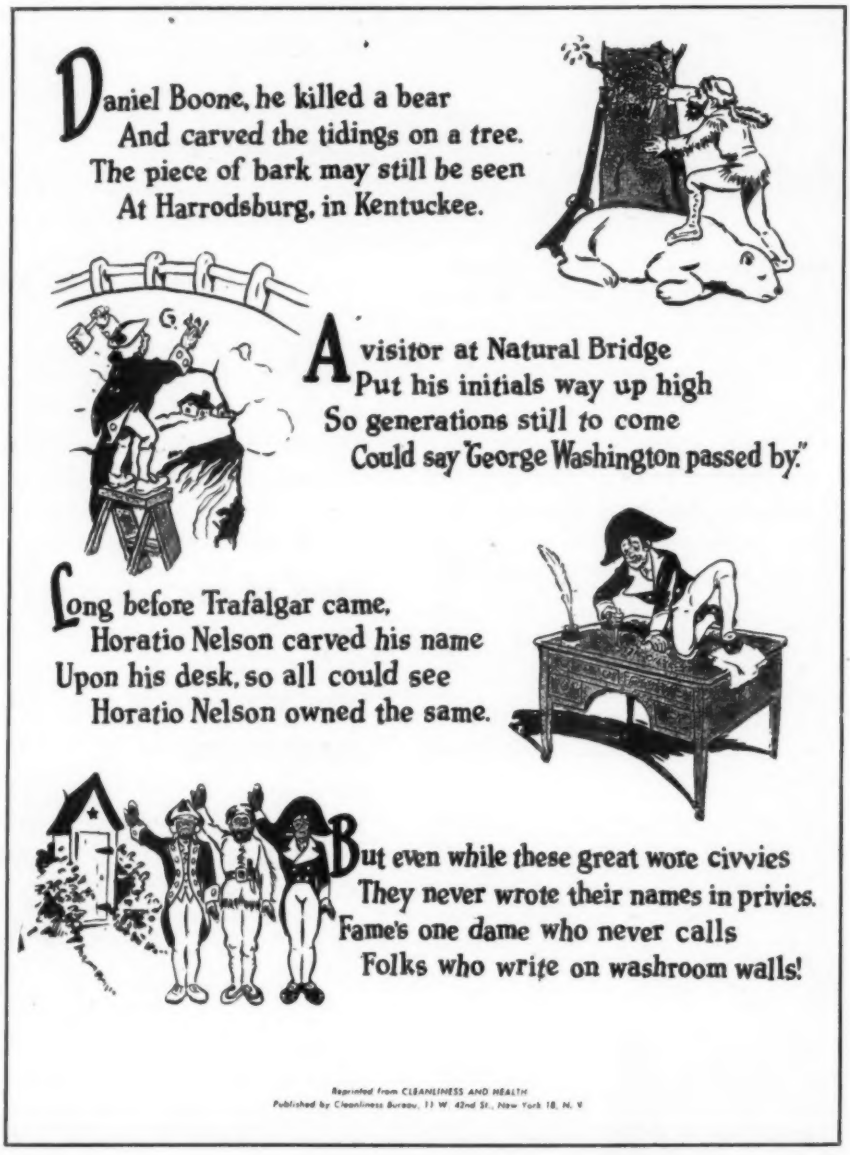
Consistency . . . *American Machinist* is currently engaged in a survey of Metal-Working plants throughout the country to determine the present and future situation in respect to manpower, expected sales volume and shop facilities.

It is a mighty fine survey and we think it will prove most revealing. However, we couldn't help commenting on one questionnaire returned from a manufacturer of fire doors for steam locomotives. Never one to be shaken by war or reconversion, this manufacturer gave as the approximate number of employees: Prewar 1—Peak 1—Now 1—Expected Postwar 1.

Steady fellow.

Next to Godliness . . . A humorous poster—reproduced below—has been designed to curb that well-known habit of scribbling on wash room walls. It was prepared by the Cleanliness Bureau, sponsored by the Association of American Soap and Glycerine Producers, 11 West 42nd St., New York 18, N. Y.

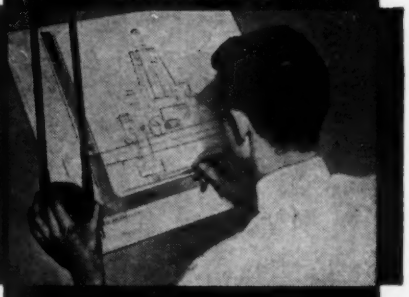
The poster is available at no charge to factories, mills, public buildings, etc. It is 8½"x11" in size and printed in red and black. Those who would like a copy for putting up in their plants should write to the Cleanliness Bureau.


Daniel Boone, he killed a bear
And carved the tidings on a tree.
The piece of bark may still be seen
At Harrodsburg, in Kentuckee.
A visitor at Natural Bridge
Put his initials way up high
So generations still to come
Could say "George Washington passed by."
Long before Trafalgar came,
Horatio Nelson carved his name
Upon his desk, so all could see
Horatio Nelson owned the same.
But even while these great wore civvies
They never wrote their names in privies.
Fame's one dame who never calls
Folks who write on washroom walls!
Reprinted from CLEANLINESS AND HEALTH
Published by Cleanliness Bureau, 11 W. 42nd St., New York 18, N. Y.

to help you

1 SOLVE BEVEL GEAR DESIGN PROBLEMS

BEVEL GEAR DESIGN ENGINEERING

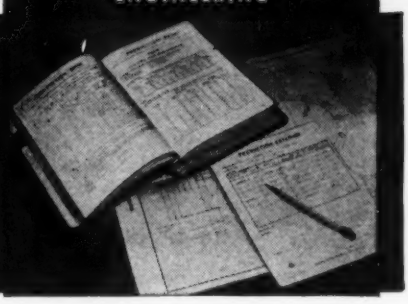


2 OBTAIN THE RIGHT EQUIPMENT FOR YOUR NEEDS

BEVEL GEAR EQUIPMENT ENGINEERING

3 ESTIMATE YOUR PRODUCTION TIME AND COSTS

BEVEL GEAR PRODUCTION ENGINEERING



the COMPLETE Gleason Engineering Service . . .

. . . when you have a problem involving bevel gear design or production, the solution can be secured from the Gleason Works—without obligation. Highly skilled engineers, backed by the company's *80 years' experience* in designing bevel gears and building bevel gear machinery, will study your bevel gear drive designs. Profitable improvements are often suggested. Correct gear cutting machines, tools and auxiliary equipment to meet your specific manufacturing requirements will be recommended. Further, we'll prepare for you estimates of production time, based upon actual shop practice. By utilizing this complete service you can save time and money.

WHAT WE NEED to help you

FOR PRODUCTION ENGINEERING

1. Blueprints of your bevel gear designs.
2. Material specifications and manufacturing tolerances.
3. Quantity of gears to be produced per month.
4. Number of working hours per month available for gear production.

FOR DESIGN ENGINEERING

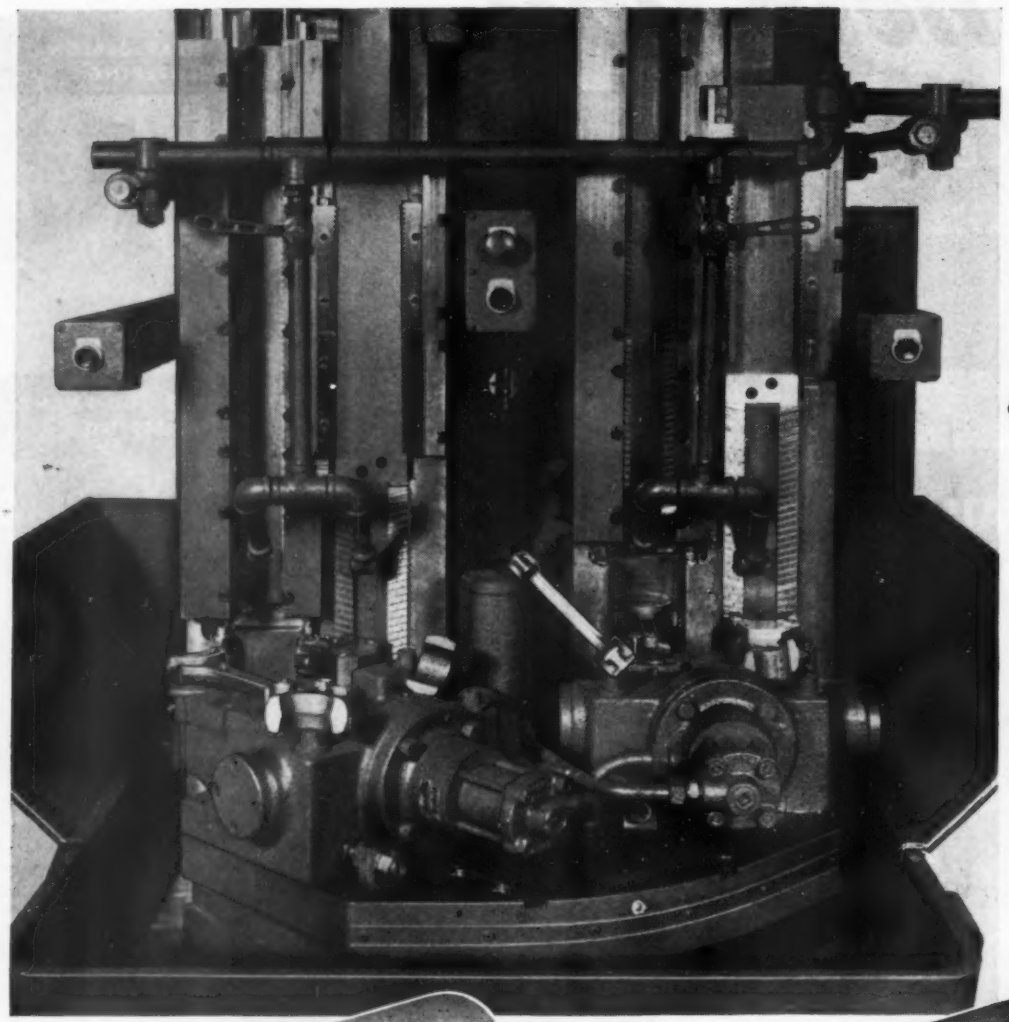
1. Preliminary layouts or prints of proposed bevel gear drive designs.
2. Type of drive.
3. Horsepower and speed required.
4. Type of loading (constant, intermittent or shock).
5. Driving member and direction of rotation.

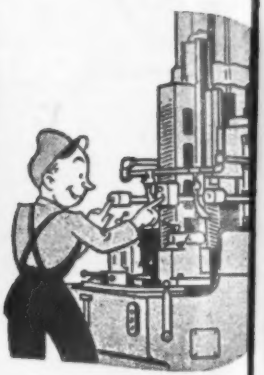
For informative literature on the design, manufacture and application of straight, spiral and Zerol bevel and hypoid gears, write on your firm's letterhead.

GLEASON WORKS

Builders of Bevel Gear Machinery for Eighty Years

1000 UNIVERSITY AVENUE, ROCHESTER 3, N. Y., U. S. A.





The *left-hand* fixture ha
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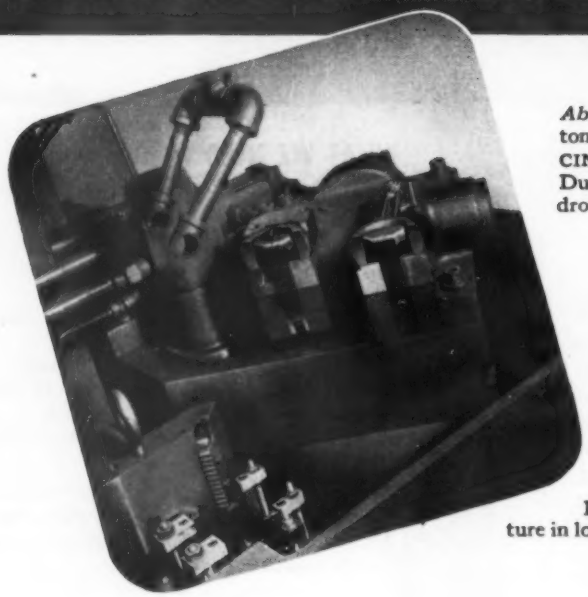
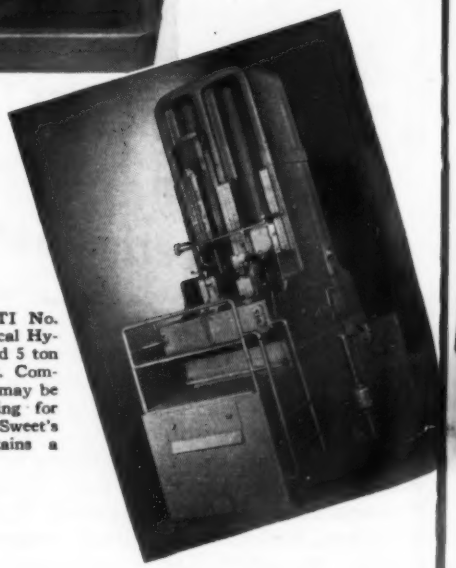


Above: Broaching piston rods and caps on a CINCINNATI No. 5-54 Duplex Vertical Hydro-Broach Machine.



CINCINNATI No. 10-66 Duplex Vertical Hydro-Broach. 1, 3 and 5 ton sizes also available. Complete specifications may be obtained by writing for Catalog M-1387. Sweet's Catalog File contains a brief description.

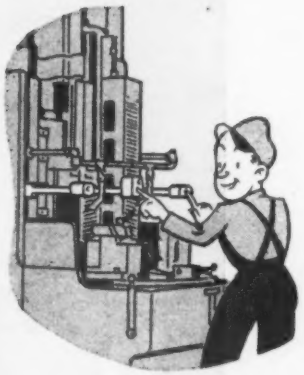
Rear view of fixture in loading position.

THE CINCINNATI M

MILLING MACHINES

New features—

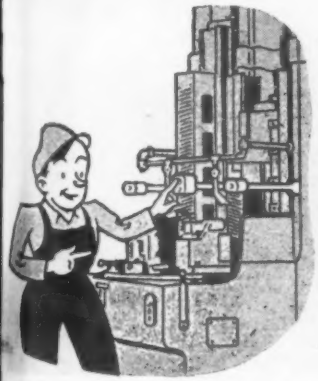
PRE-SET CYCLE CONTROL, AND HYDRAULICALLY OPERATED FIXTURES . . . COMBINE TO BOOST PRODUCTION



The *right-hand* fixture has been unloaded and properly reloaded, and the cycle will continue.

Broaching several surfaces of rods and caps at the rate of 325 pairs per hour (that's 650 parts) is a lot of production for one machine and one operator, but it's being done with this CINCINNATI No. 5-54 Duplex Vertical Hydro-Broach, tooled up by Cincinnati Application Engineers. Two new features make this production possible:

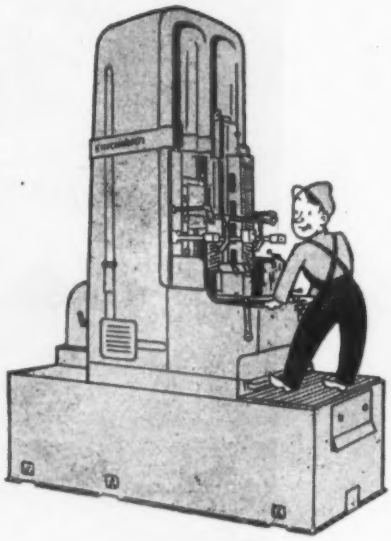
1) *Pre-Set Cycle Control*—It gives the operator added confidence; it's safer, and it eliminates any possibility of "crack-ups". The rams do not descend on their cutting stroke until the operator presses the button.



Operator reconsiders because work did not line up properly, and he does not want the ram to descend. He stops the cycle.

2) *Hydraulically Operated Fixtures*—They clamp and unclamp *automatically* with even and consistent hydraulic pressure.

These two features are available with CINCINNATI Vertical Hydro-Broach Machines. Then there are many other features you'll be interested in, and which help to give these machines top rating as cost-reducing equipment. May we tell you more about them?



Operator stops complete machine at end of cycle by stepping on treadle.

CINCINNATI

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

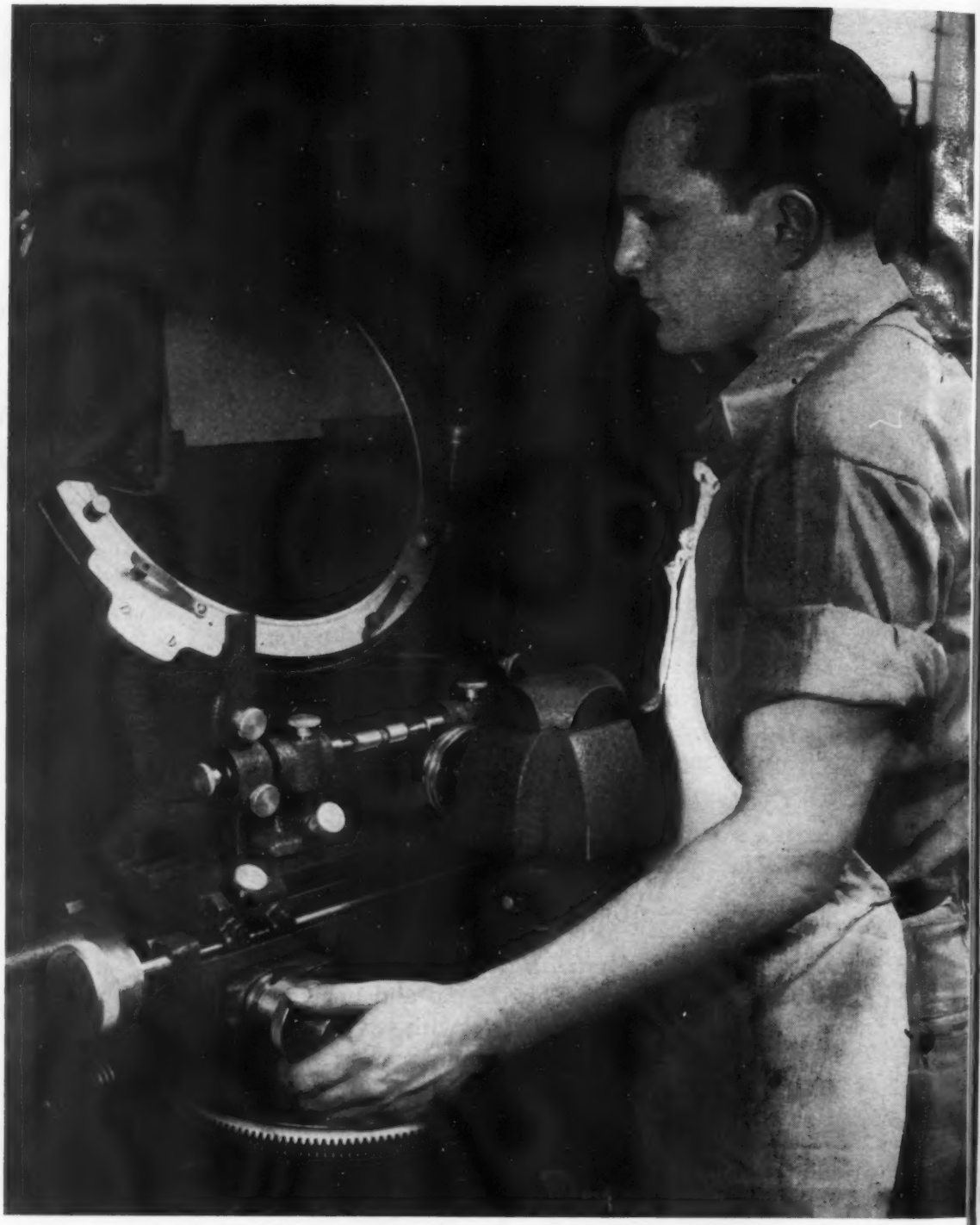


Photo courtesy of United Precision Products Company, Chicago, Illinois

This book "Beyond a Shadow of a Doubt" will tell you more about our Optical Comparators and what they are doing.

DID YOU KNOW...
THAT JONES & LAMSON OPTICAL COMPARATORS ARE USED TO INSPECT KNITTING NEEDLES AND SINKERS USED FOR KNITTING RAYON FABRICS

15 minutes . . .

AS COMPARED WITH ½ a day!

Precision gages and pins are checked for "utmost accuracy" on a Jones & Lamson Pedestal Optical Comparator and Measuring Machine in less than one tenth of the time it formerly took to inspect them without a Comparator. They are inspected for Length, Depth, Outline, Angles, Straightness and Grooves. This Optical Comparator is also used for inspecting Form Tools, Threads and other Profiles.

JONES & LAMSON
MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

OPTICAL COMPARATORS

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

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DIRECT PROJECTION COMPARATOR
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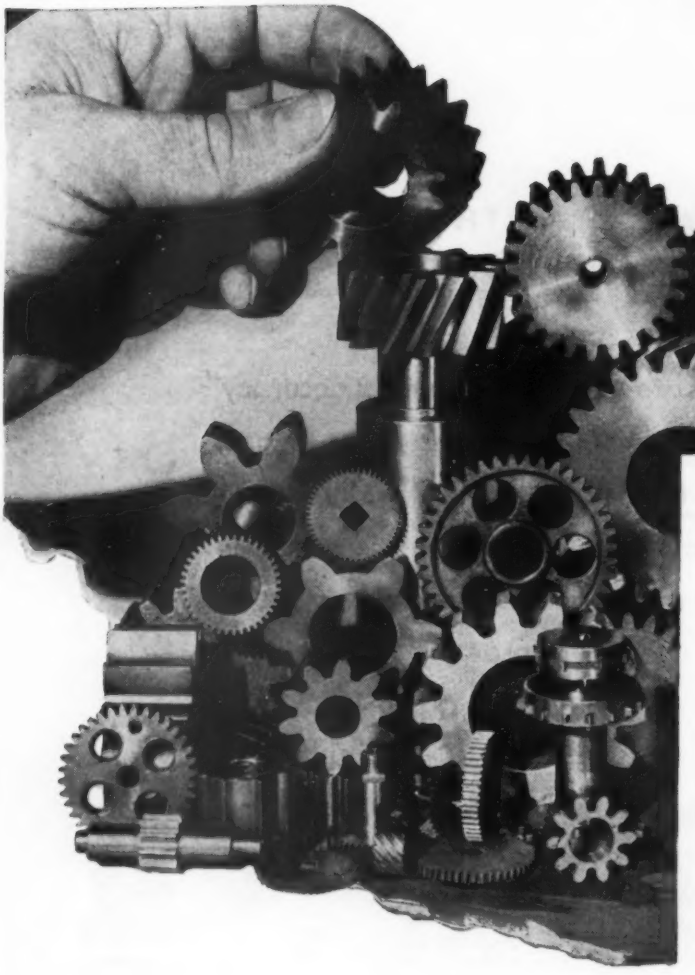
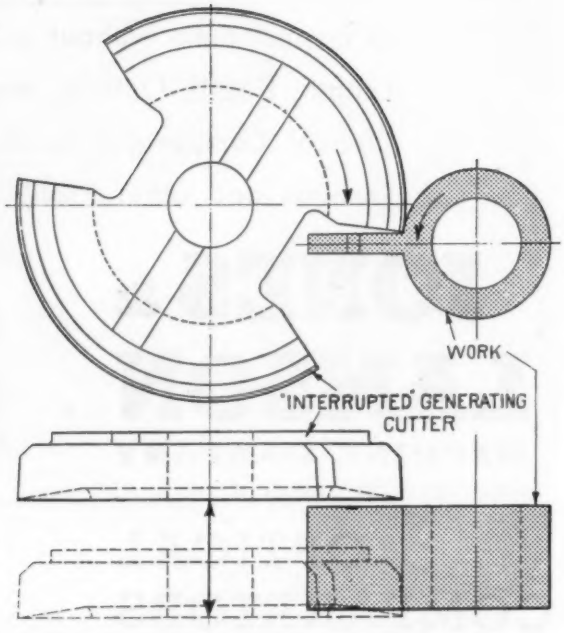
PEDESTAL COMPARATOR 30" DIAM. SCREEN

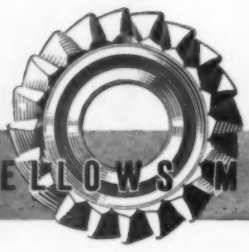
Versatility . . .

OF THE F





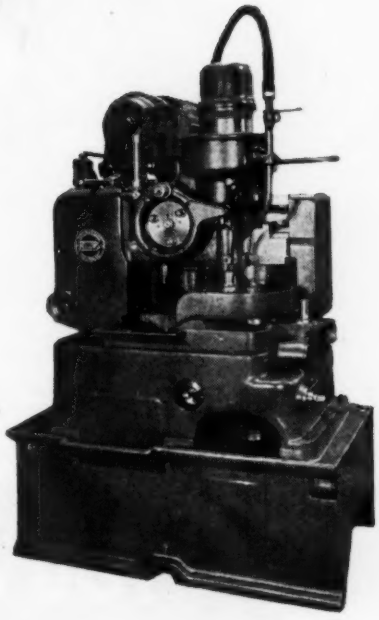
Direction rotation of cutter and work are reversed to finish this part in two cuts by equipping the machine with a reversing mechanism.



THE FELLOWS METHOD . . . MACHINES AND TOOLS FOR L

. . A STANDOUT ASSET

HE FELLOWS METHOD



7A-Type Fellows Gear Shaper

The probabilities are that you have always considered Fellows Gear Shapers as adapted only to the cutting of external and internal spur and helical gears. The Gear Shaper, however, is a highly versatile machine with built-in ability to handle a large variety of irregularly-shaped contour parts.

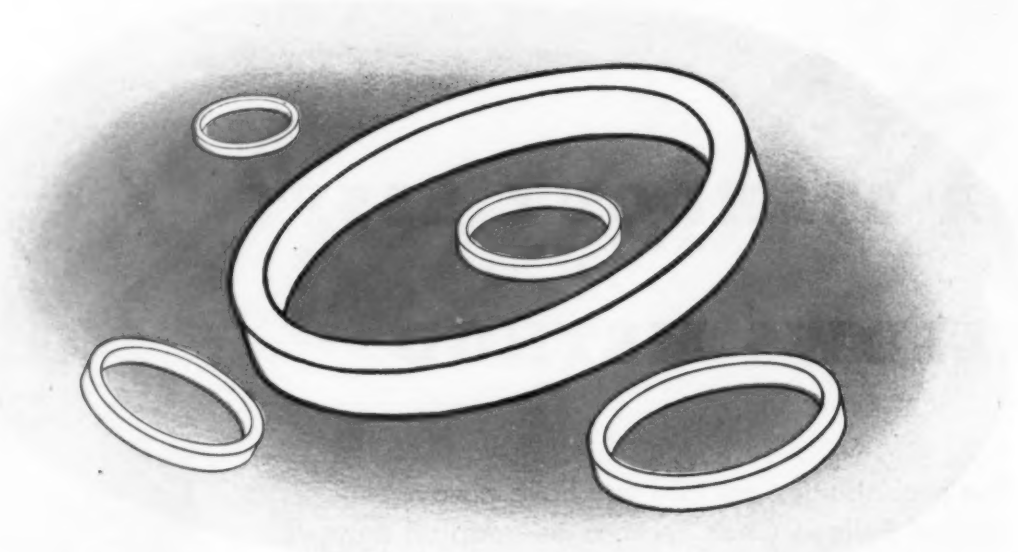
For example, in the machining of unusual gears or parts, the Gear Shaper accomplishes in a single set-up what would ordinarily necessitate a series of operations—or the purchase of a high-cost, single-purpose machine tool.

Furthermore, when the Gear Shaper completes the run on one part, it awaits only a change of cutters and work outfits—or fixtures—before being made ready for the next job.

For further details on the machining advantages and economies that result through the use of the Fellows Method, write for your complimentary copy of "The Art of Generating With a Reciprocating Tool". The Fellows Gear Shaper Company, Springfield, Vermont, or 616 Fisher Bldg., Detroit 2, or 640 West Town Office Bldg., Chicago 12.

Fellows

OR ALL OPERATIONS FROM BLANK TO FINISHED GEAR



Eight sizes of fiber rings, 1" to 4¾" diameter, and ⅜" thick are Thru-Feed ground on a CINCINNATI *No. 2 Centerless, using interchangeable arbors. Production, 2500 per hour. Photograph on opposite page illustrates Type C Long Bar Fixture.*

YOU CAN GRIND ANY LENGTH FROM THIN RINGS TO BARS 18 FEET LONG

Between the extremes of fiber rings and steel bars 18 feet long, CINCINNATI Centerless Grinders handle an unusually wide variety of work in these three classifications:

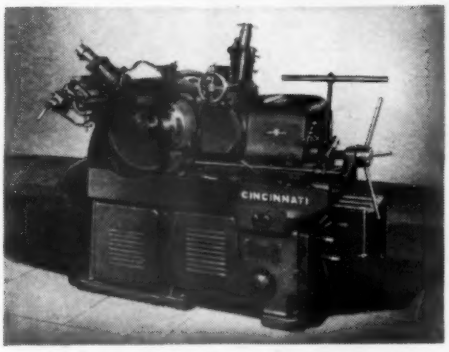
1) THRU - FEED — Straight parts from discs and rings up to bars 18 feet long, and diameter ranges from hypodermic needles to 6″ bearing races, depending upon equipment selected.
2) INFEED—Straight parts up to the width of the wheel; long parts, ground on one end (roller infeed method); spherical; out-of-balance; curved shapes, such as bathtub fixtures, depending upon equipment selected.
3) END FEED—Taper work.

Parts made of virtually all materials are ground successfully on the CINCINNATI Centerless—ferrous and nonferrous metals; glass, hard rubber, plastics, cork, porcelain and other nonmetallic substances. ¶ Perhaps the low-cost centerless method could be adapted to more of your cylindrical finishing operations. Why not talk it over with the Cincinnati Engineers? For many years they have been developing new applications for centerless and centertype grinding, and will be glad to give you the benefit of their knowledge and long experience.

CINCINNATI

CENTER TYPE GRINDING MACHINES

a Cincinnati Centerless!



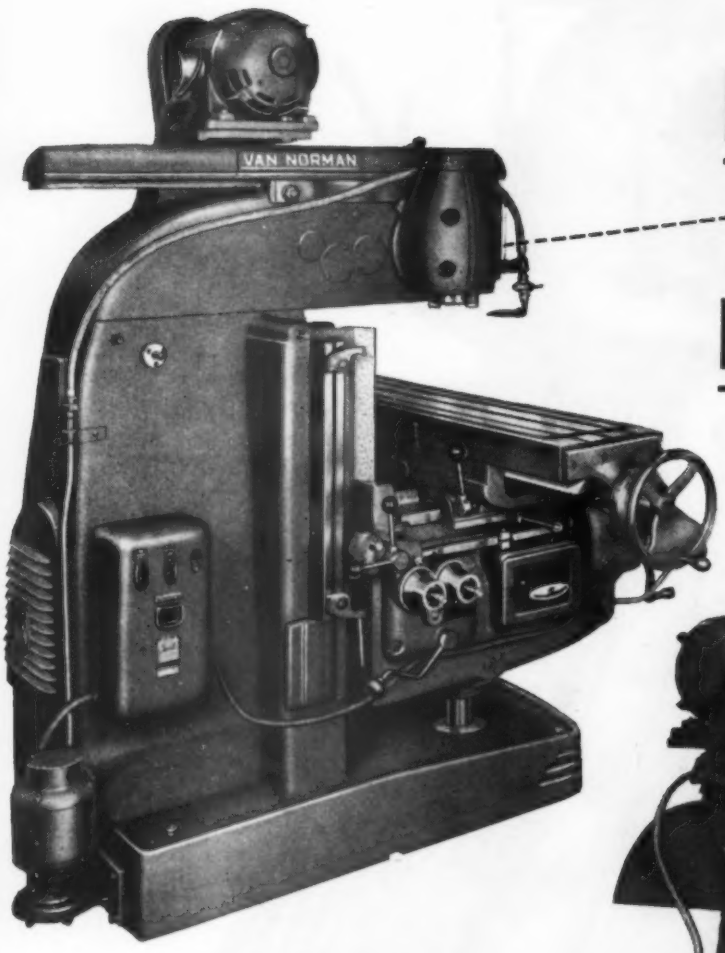
Small illustration above: **CINCINNATI** No. 2 Centerless Grinder. Catalog G-456-2, containing complete specifications, will be sent on request. Sweet's Catalog File for Mechanical Industries gives a brief description. Large illustration: A **CINCINNATI** No. 2 Centerless equipped with Type C Long Bar Attachment for grinding bars up to 18 feet long.

GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

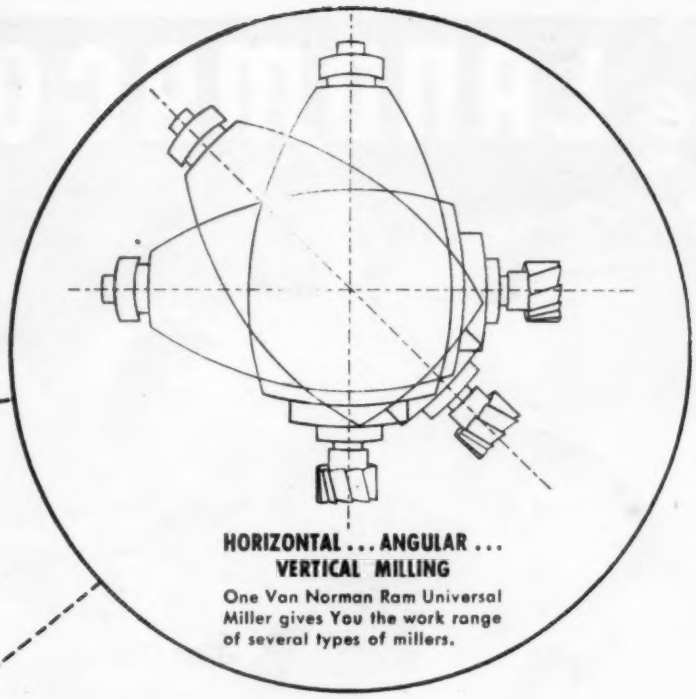
CENTERLESS GRINDING MACHINES - CENTERLESS LAPPING MACHINES

For High Production Output...and Low Idle Machine Time



No. 36 Ram-Type Miller
Table: 58" x 13"
Ram movement 19"

No. 26 Ram-Type Miller
Table: 50" x 12"
Ram movement 19"



HORIZONTAL . . . ANGULAR . . .
VERTICAL MILLING

One Van Norman Ram Universal Miller gives You the work range of several types of millers.

USE VAN NORMAN RAM-TYPE MILLING MACHINES

One machine tool that you won't have to worry about at reconversion time is a Van Norman *Ram-Type* Milling Machine . . . for this miller is so versatile that it enables you to perform any and every milling job from horizontal to vertical . . . simply by positioning the adjustable cutterhead which is mounted on a movable ram. Why do you benefit . . . because with this one machine you have the work range of several single purpose millers. This enables you to keep the Van Norman miller working practically all the time . . . also many jobs can be carried through to completion without changes in the workpiece setup — saving time and reducing errors.

Another reason the *Ram-Type* miller increases production is the front and rear directional control of power feeds and manual feeds . . . resulting in ease of operation, less worker fatigue since he doesn't have to run back and forth to line up or watch the cut.

The massive column, heavy-duty movable ram which has dovetail ways, and large knee, saddle and table assemblies provide exceptional rigidity which assures accuracy of every type of cut. In addition, such features as large, easy-to-read dials, single lever feed selector, conveniently located and easily reached speed selector, rugged Ram-Type overarm and arbor support, hardened alloy steel precision gears — all assure accuracy, economy and maximum production. Van Norman *Ram-Type* Millers are available in many models with plain or swiveling tables. Write for information, today.

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

"It pays to Van Normanize"

The LANDMACO

THE LANDIS CHASER

The finest thread cutting tool in industry.

Close-up of the threading operation of the Double Head Landmaco Threading Machine.

Write for Bulletin H-75

LANDIS

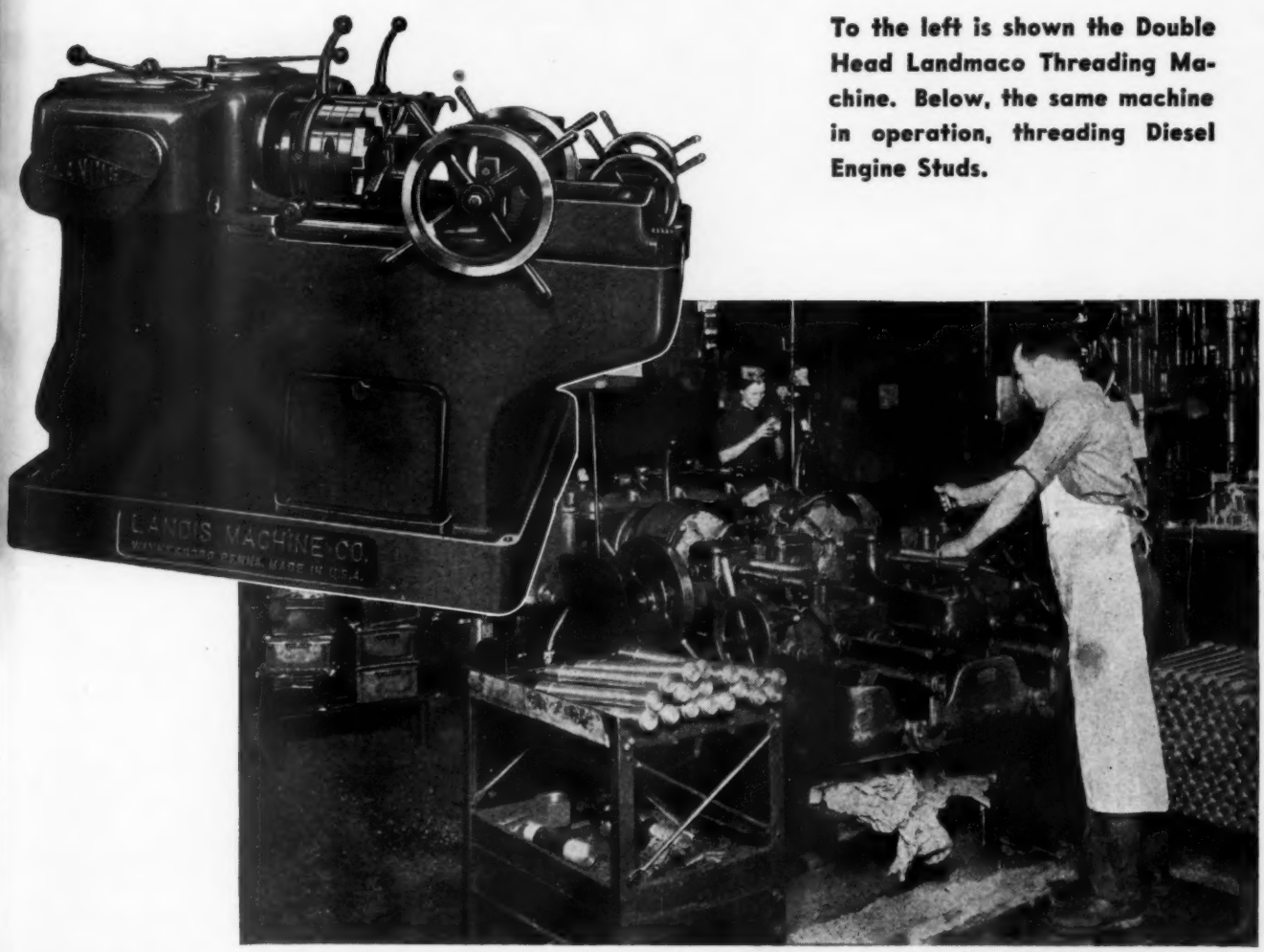
THREADING MACHINERY • THREAD CUTTING DIE HEADS

Threading Machine

Assures the Fine Threading Accuracy Required for Diesel Engine Studs

Cylinder Head Studs of the Diesel Engine are made from heat-treated alloy steel and present a difficult threading operation. The threads must be held to extremely close tolerance specifications.
Manufacturers of these parts using Landmaco Threading Machines have no difficulty in meeting the specifications.

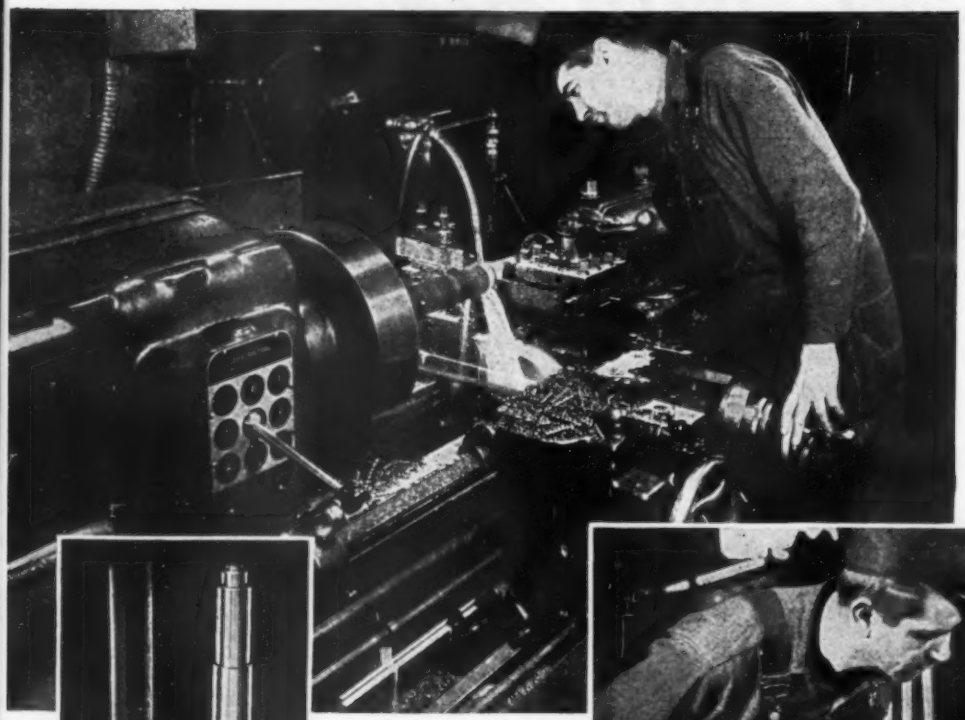
To the left is shown the Double Head Landmaco Threading Machine. Below, the same machine in operation, threading Diesel Engine Studs.



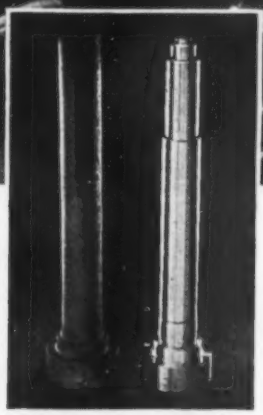
S MACHINE CO. WAYNESBORO PENNA. U.S.A.

COLLAPSIBLE TAPS · PIPE THREADING AND CUTTING MACHINES

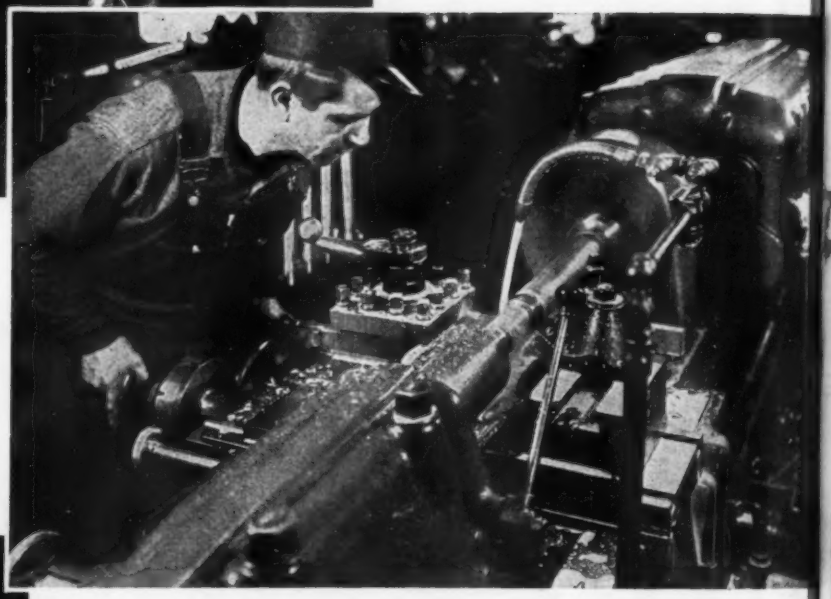
MINUTES INTO PROFITS...



20-In. "AMERICAN" Multi-Production Lathe, turning elevating pinion shafts from rough forgings for 40 M.M. anti-aircraft guns.



THIS to THIS in 18 minutes



This is no stunt! It's a steady production job day in and day out. Total floor to floor time, **18** minutes. Cutting speed, 175'. Feed, .015". Maximum depth of cut, 3/8". Material, S.A.E. 4640 steel—heat-treated.

PRODUCTION EQUIPMENT

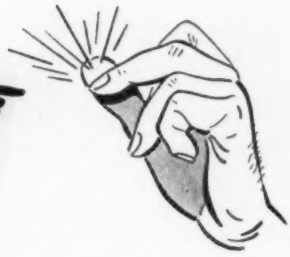
Front and rear tool holders. Automatic length stops. Direct reading cross feed dials with indicating clips. Built-in roller bearing tailstock center. This is the kind of performance that transforms minutes into profits.

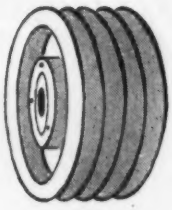
THE AMERICAN TOOL WORKS CO.

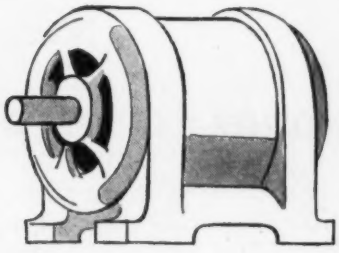
Cincinnati, Ohio, U. S. A.

Lathes and Radial Drills

Just like this — this — goes on or off this —







Yes, it's a snap to change sheaves now, when you provide Allis-Chalmers' new "Magic-Grip" — *fastest mounting and demounting sheave on the market.* Saves time and money.

SEE WHY THE NEW "MAGIC-GRIP" MOUNTS FAST, PERFORMS SMOOTHLY

1 Place sheave on shaft. Slides on smoothly because clearance is provided by expanded bushing. There's *no* hammering — *no* forcing! Complete sheave and bushing unit comes intact—ready for quick, easy mounting.

2 Align exactly, using straightedge, (It's easy with this free-sliding sheave.) Then tighten three cap-screws; sheave is locked to shaft, *grips like magic!* No set screws to damage the shaft. Write A-C for Bulletin B6310.

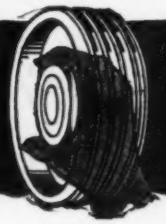
RECONVERTING?

GET THIS NEW FREE KIT!

To help you find out how your present equipment will fit into future production, A-C offers a new free "Reconversion Inventory Kit" — Fact Sheets and Check Lists to speed your appraisal of V-belt drives, electric motors, and centrifugal pumps. Applies to all makes. Call your A-C distributor or district office, or write Dept. 61, ALLIS-CHALMERS MFG., Milwaukee 1, Wisconsin.

A 1857

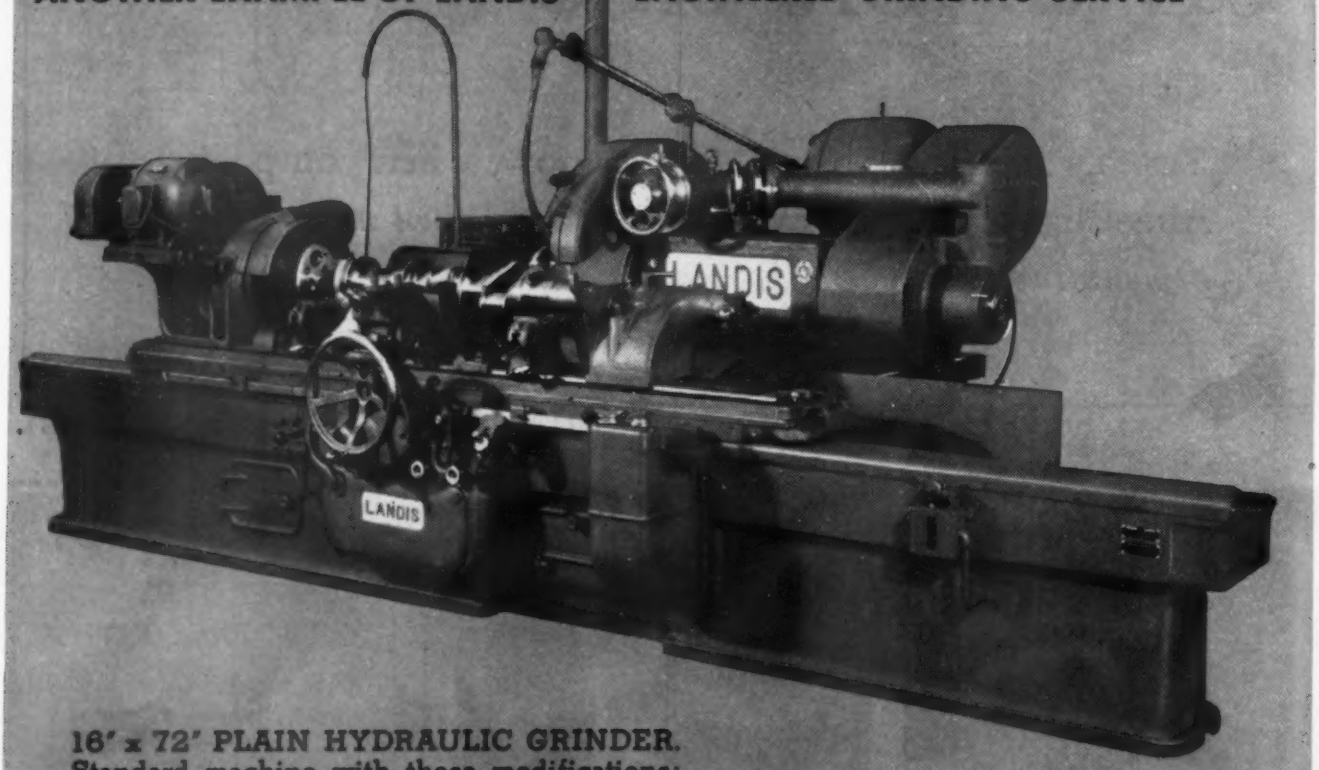
Allis-Chalmers Texrope

"MAGIC-GRIP"  **SHEAVES**

DETROIT PUBLIC LIBRARY

Crankshaft Production Speeded

ANOTHER EXAMPLE OF LANDIS ENGINEERED GRINDING SERVICE



16" x 72" PLAIN HYDRAULIC GRINDER. Standard machine with these modifications: shoulder grinding attachment; hydraulic power infeed; ball bearing live work centers; table type work locators; jib crane; double work rest.

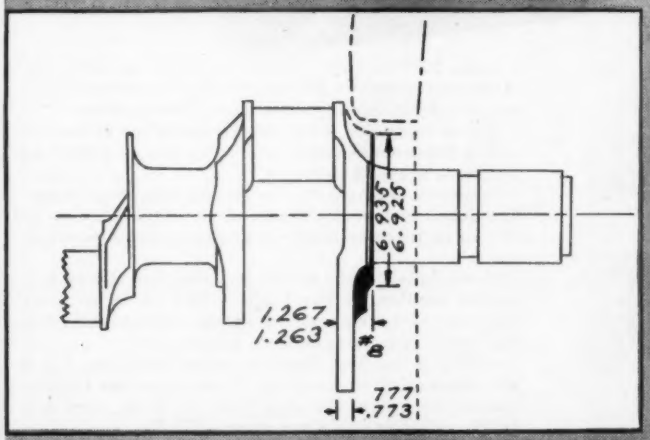
LANDIS TOOL *Precision Grinders*

LANDIS TOOL COMPANY

ONE GRINDING OPERATION *Eliminated* BY A MODIFIED STANDARD MACHINE

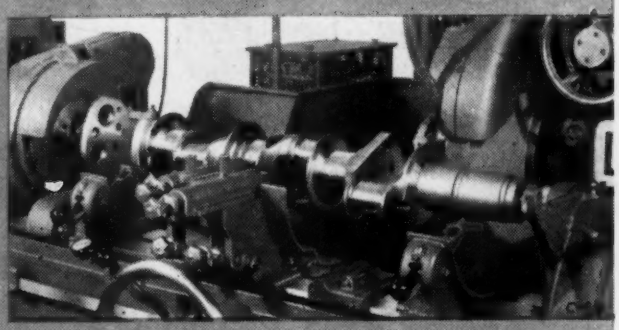
THE PROBLEM

To speed up production of airplane engines to meet wartime demands by reducing grinding time of certain crankshaft fillets. Two operations were necessary with manual feed.



THE SOLUTION

Starting with a standard machine use was first made of the maximum angle at which the wheel-base could be set without interfering with the work. This was only 4°. This small angle together with a formed wheel made possible plunge grinding of the fillet. The addition of Landis Tool hydraulic rapid infeed still further speeded the grinding and eliminated manual feed.



For maximum strength crankshafts of aircraft engines must have fillets and these had to be ground to close tolerances.

Landis Tool engineers were called in when a production problem was created by the demand of the armed services for more airplane engines. Starting with a standard machine—modifications were made that cut grinding time in half with a resulting increase in crankshaft production.

Your grinding problem may involve larger or smaller parts, but you can depend on the simplest and lowest cost solution. Our engineers are available to help you solve your grinding problems—call on them.

37

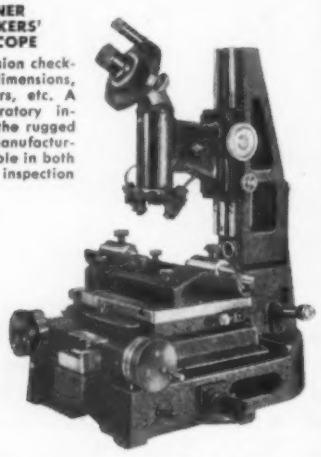
LANDIS TOOL *Company*

WAYNESBORO, PA.

SCHERR
Tools to SEE with

GAERTNER TOOLMAKERS' MICROSCOPE

For rapid precision checking of critical dimensions, angles, contours, etc. A scientific laboratory instrument with the rugged strength of a manufacturing tool. Valuable in both tool room and inspection department.



SCHERR BORE INSPECTOSCOPE

For highly magnified and illuminated inspection of bores as small as .110" diam., and as long as 72". Gives right angle or oblique vision of bore surface at any point.

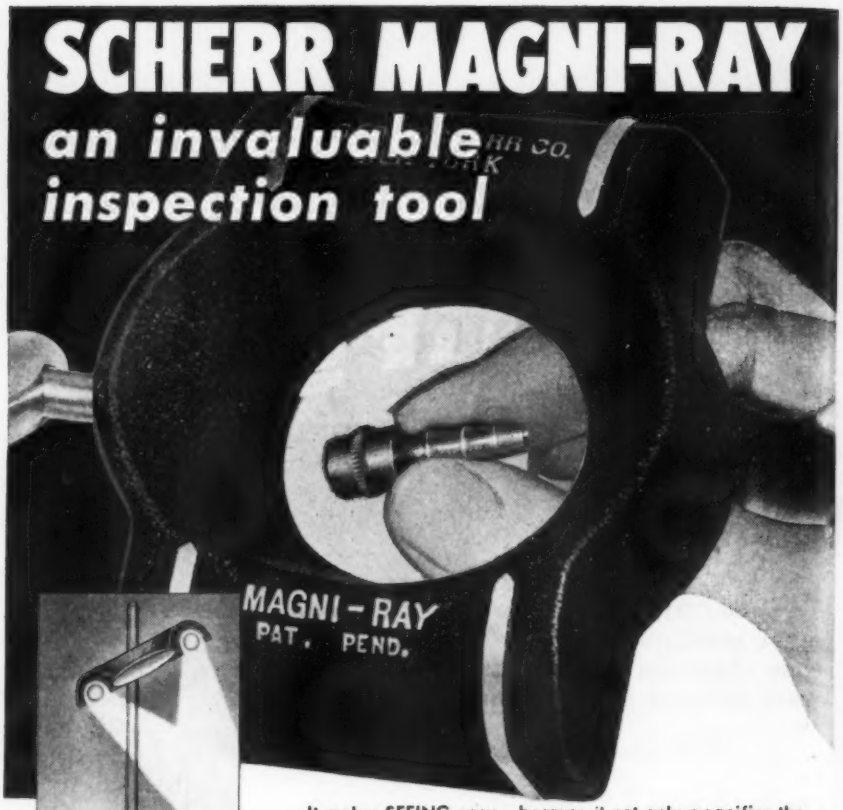
SPENCER BINOCULAR MICROSCOPE

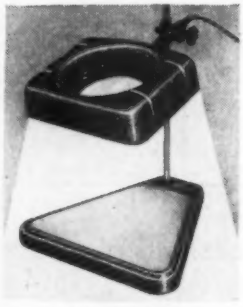
Permits three-dimensional vision at high magnification in inspecting small parts, contours, surface finish, etc. Choice of objectives, .7 x to 8 x and of eyepieces, 9 x to 18 x. Essential wherever materials must be inspected for surface flaws, scratches, irregularities.

SURFACE FINISH STANDARDS

When used with Spencer Microscope, aids uniformity in surface finish by supplying comparison standards. All specimens clearly marked and graded.

SCHERR MAGNI-RAY
an invaluable inspection tool





The Model C Magni-Ray

It makes SEEING easy — because it not only magnifies the work under inspection, but also floodlights it with powerful rays of light shielded from the eyes of the operator.

It gives true vision — the immense advantage of two-eye seeing (three-dimensional vision). The lens is ground by experts to avoid all distortion.

Thousands of Magni-rays are serving many large inspection departments today. Thousands more are individually serving on precision machines or critical toolroom operations.

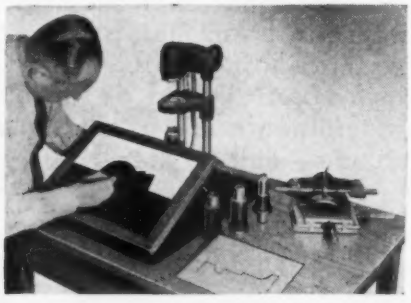
Heavy base permits of swinging the lens to any convenient position, at any height within 14 inches. Lens frame can be quickly removed from base and held in hand for inspecting surfaces on large objects.

MODEL A has 3 in. diameter optical glass lens, 1½ x plus (depending on focusing). The most popular type for general inspection. Complete with two bulbs, cord and switch, swiveling clamp and stand — $18.50.

MODEL B achromatic lens magnification power of 3 plus. Complete, $27.50.

MODEL C for larger work, has 5 in. optical glass lens of 1½ x plus. Handle on Magni-Ray unit for convenience in holding it in the hand, detached from the base by quick-release swiveling clamp. Complete, $33.00.

If in doubt, try one Magni-Ray — and learn why this seeing tool is so commonly seen in so many shops. Shipment at once. Further details on request.



WILDER MICRO PROJECTOR

Throws magnified shadow image of work for comparison with master drawing. Most accurate way to check small parts, threads, gears, odd forms. Ideal for checking tool wear on screw machines by periodical inspection of work. Many other uses. Write for descriptive bulletins.

GEO. SCHERR CO., Inc. 201 LAFAYETTE STREET NEW YORK 12, N. Y.

Continued

Grinding Questions Answered

By Allen Steele, Manager, Dayton Grinding Wheel Division
SIMONDS WORDEN WHITE COMPANY

This series of questions and answers is presented as a practical aid in the solution of many of the more common grinding problems. Readers are invited to send in their own grinding questions, without obligation of any sort. All questions will be answered by mail or in this column. No identities will be revealed if published.

56 Q. *"About four weeks ago, we started a surface grinding job of hardened steel parts. The job went along fine until about a week or so ago when slight scratches began to appear on some of the parts. What could cause this?"*

A. It is our opinion that your coolant reservoir needs cleaning out. This should be done about every two weeks. Otherwise, the coolant may become so loaded with wheel and work particles that they will not settle out at a normal speed. It might also be advisable to employ a coolant filter, especially if the work requires a high finish.

57 Q. *"In cylindrical grinding for a fine finish, does the width of the wheel determine the traverse speed?"*

A. No—the wheel width does not determine the traverse speed. The traverse speed is determined by the diameter of the piece being ground and the work speed. In general, where a fine finish is desired in cylindrical grinding the traverse per revolution of piece being ground should be approximately one-third (1/3) of the traverse used in the roughing operation.

58 Q. *"In grinding a twist drill job on a centerless machine, what material is considered best for the blade?"*

A. When the material to be ground varies in hardness from end to end (which is usually true of pieces like twist drills) high speed steel blades are usually recommended.

59 Q. *"Will you please be so kind as to explain how spherical work is ground and held to tolerances as close as .0002"?"*

A. In our opinion the grinding of extremely accurate spherical work is one of the most interesting developments of modern grinding practices. It is done on centerless machines. Both the grinding wheel and the regulating wheel are trued radially. A special collet is provided for mounting the regulating wheel so that the latter is at an angle of 12 degrees to its axis in relation to the axis of the grinding wheel.

60 Q. *"The other day I overheard a conversation in which the term 'generative' grinding was used. Just what does 'generative' grinding mean?"*

A. The term "generative" grinding is usually used in connection with the grinding of gear teeth. The shape and spacing of the teeth are produced through the use of a master rack and gear, and the grinding wheel is trued to the required pressure angle. The grinding wheel is then set for the correct reciprocating action and the gear is ground as it rolls past the wheel. This is called "generative" grinding.

61 Q. *"We are grinding cast iron shim blocks 9" long by 4" wide on a Model F Thompson Grinder and put six on the table at one time. The job requires a fine finish, but we haven't been able to find a wheel that will perform economically. We remove about .006" on each side."*

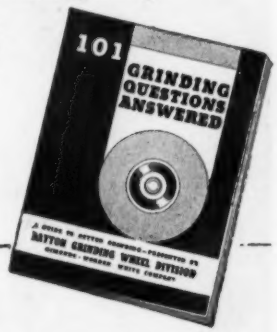
A. For the job you describe, we recommend our C60-I-13-V-14 (old marking 960 I-3-V). We believe this wheel will give you the performance you are looking for.

62 Q. *"Will you please tell me the correct procedure for grinding nicks out of the top of cemented carbide tipped tools?"*

A. To grind nicks out of the top of a cemented carbide tool, first grind the tip on the periphery or corner of a straight wheel, or if it is more handy, you can use the corner of a cup wheel. Grind the tip just deep enough to eliminate the nicks, leaving approximately 1/32" land around the tip's cutting edge. Next, using a cup wheel, finish grind the top of the tip flat against the side of the wheel. This method not only reduces the contact area for the finish grind, but gives a cool, fast cutting action.

THIRD EDITION READY NOW... a guide to better grinding!

101 "Answers" to everyday grinding problems—indexed for quick, easy reference—will be sent FREE to anyone interested in better grinding practices. Just fill in and mail coupon below.
SIMONDS WORDEN WHITE CO., DAYTON 7, OHIO.



DAYTON GRINDING WHEELS

SIMONDS WORDEN WHITE CO.,
712 Negley Place, Dayton 7, Ohio

Please send me Free Booklet "101 Grinding Questions Answered"

Name_____

Firm_____

Address_____

City_____ Zone_____ State_____

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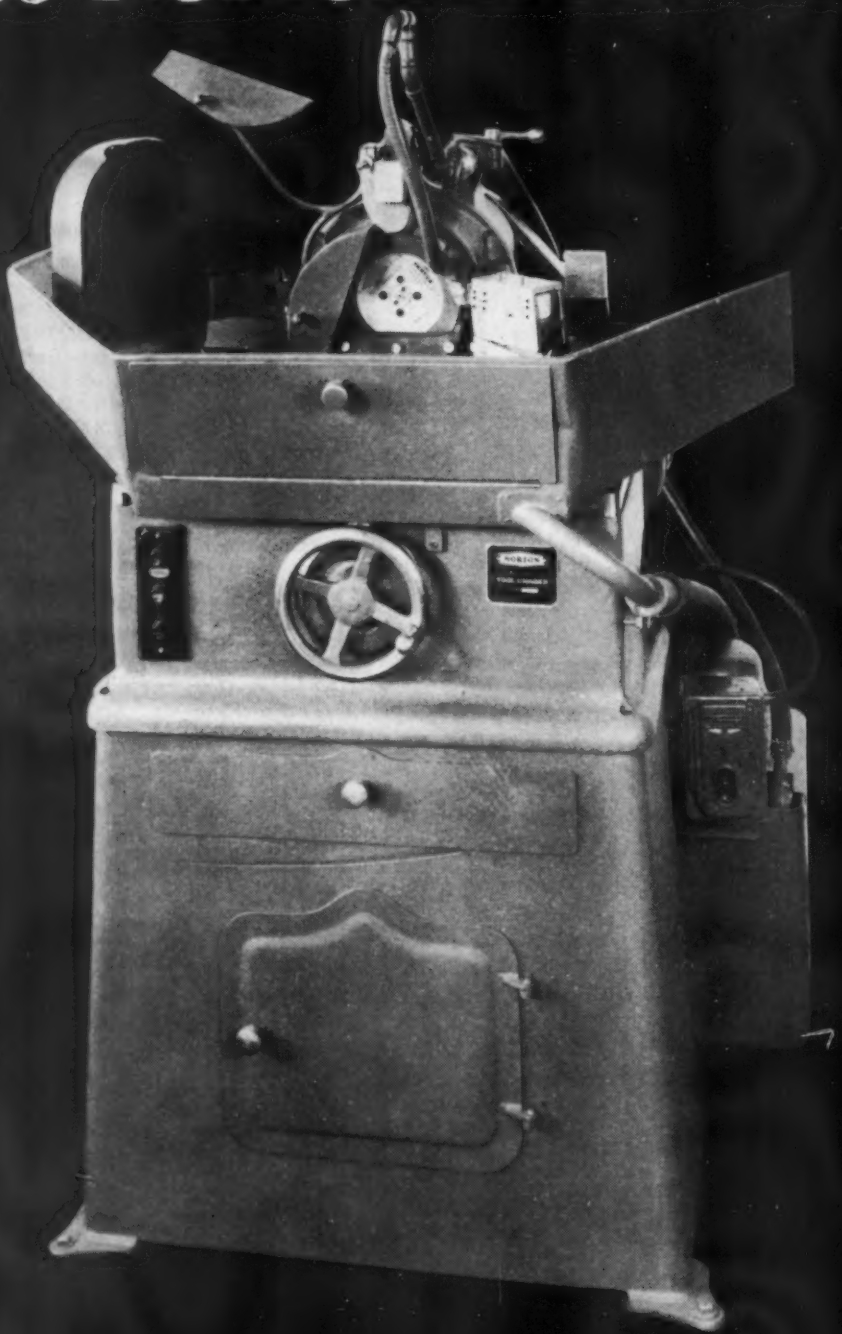
A BETTER WAY TO GRIND

...*the* Norton Bura-way



NORTON GRINDERS
and Lappers

SINGLE POINT TOOLS

A sturdy, well-balanced machine for grinding convex single point cutting tools. The machine develops master cams from a master tool and duplicates thereafter from the cam.

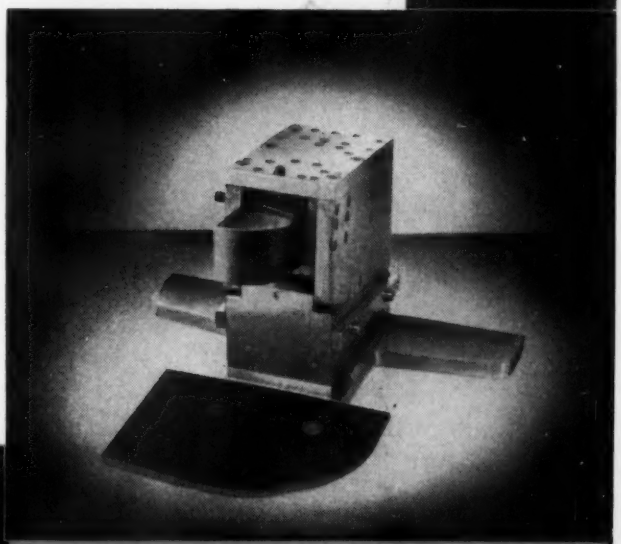
Due to the rugged construction of the Norton Bura-way Grinder, it produces a finish that is ideal for carbide tipped tools.

Outstanding in duplication of form and finish.

Catalog giving full information on the Norton Bura-way on request — no obligation.

NORTON COMPANY
WORCESTER 6, MASS.

M-512



Tool holder with tool in place and generating cam at base.

Generating cam contour against grinding wheel with master tool.

Grinding carbide tool with cam attached on holder.

10-year

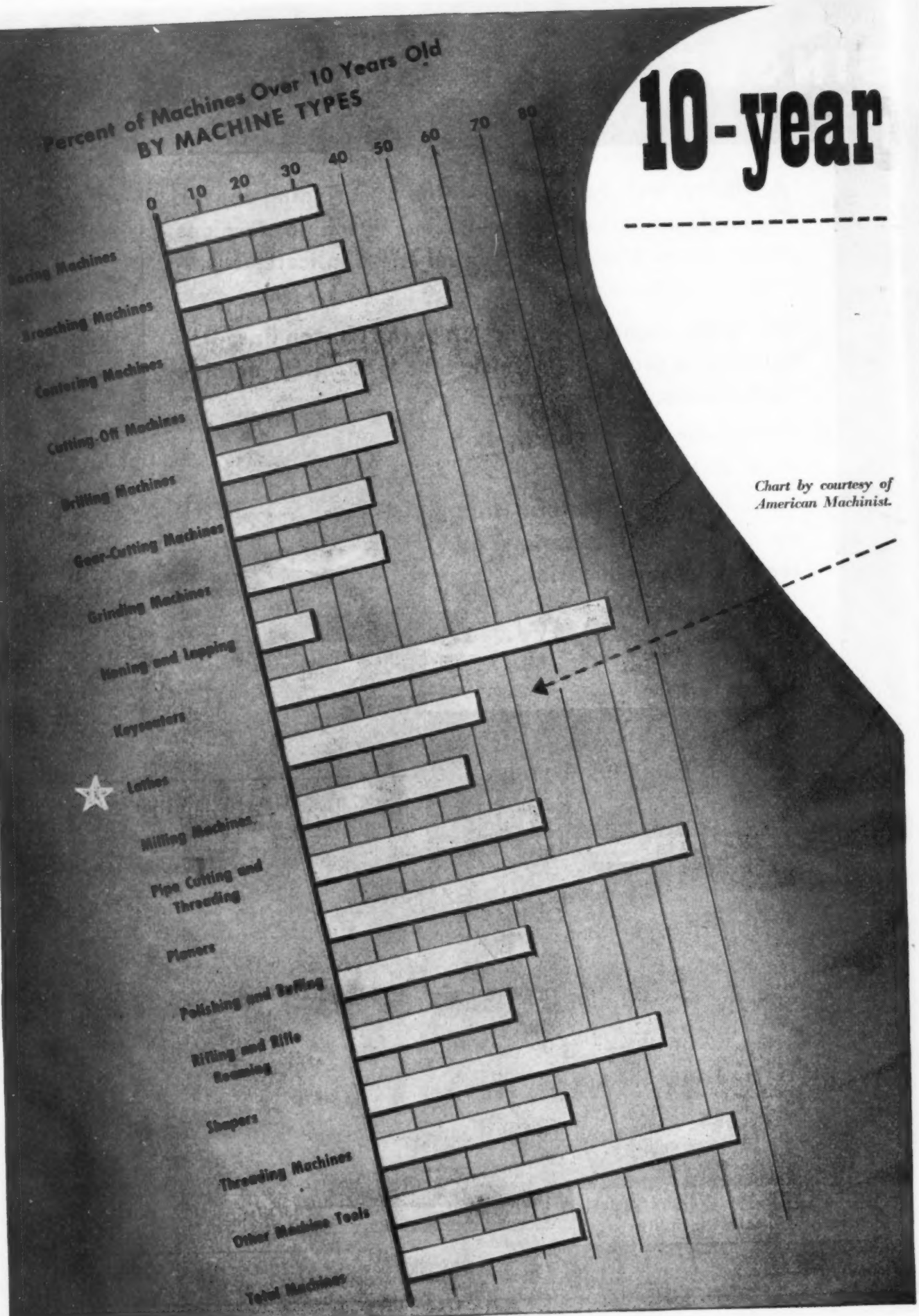


Chart by courtesy of American Machinist.

old lathes are ~~out of date~~ no economy

Plants with engine lathes that are 10 years old, or more, cannot expect to match the production quality or economies of those which take advantage of modern equipment.

They cannot hope to compete, now or in the future, with the high accuracy and low-cost machining made possible by such Monarch developments as:

Standard turning machines

Precision toolroom lathes

Automatic sizing machines

Form turning and boring machines

Shapemaster machines for turning odd-shaped work

10" Precision Manufacturing Machines

Magna-Matic all-electric turning machines

Ball bearing taper attachments and taper attachment variators

10" Sensitive Precision Toolmaker's Lathes

The ability of these Monarch machines to cut costs, increase and improve production has long been proved. If you are not fully informed of their advantages, ask any Monarch office for details. Our engineers will show you proof and furnish job analyses for your own work, to help you produce more goods for more people at lower cost. If your reconversion needs cannot be met by our present deliveries, we'll gladly try to assist you in the selection of Monarchs from government surplus stocks.

THE MONARCH MACHINE TOOL COMPANY • SIDNEY, OHIO

DIRECT FACTORY BRANCHES

CHICAGO 6, ILLINOIS
622 W. Washington Blvd.
Phone: Randolph 4295

CLEVELAND 6, OHIO
Room 209 Upper Carnegie Bldg.
10465 Carnegie Avenue
Phone: Garfield 2590

DETROIT 2, MICHIGAN
801 Fisher Building
Phone: Trinity 1-0426

INDIANAPOLIS, INDIANA
Maco Building
38 and College Avenue
Phone: Wabash 2650

NEWARK 2, NEW JERSEY
635 Industrial Office Bldg.
Phone: Mitchell 2-1770

PITTSBURGH 22, PENNSYLVANIA
512 Empire Building
Liberty Ave. and Stanwix St.
Phone: Atlantic 6428

Representatives in Principal Cities

The Monarch fully automatic, all-electric Magna-Matic is the most universal turning machine in American industry.

MID-WEST WHEELS *for the* TOOLS OF PEACE

● The new tool room grinding wheel of the Mid-West Abrasive Company, tested and found superlative in the crucible of war, now whirls for the tools of peace with equal success.

The Mid-West wheel clearly shows its superiority in high-speed tool steel operations.

You'll find that same superiority exemplified also in Mid-West honing stones, sharpening stones, sandpapers, or any of the broad range of Mid-West abrasive products.

Call in a Mid-West field engineer to solve your abrasive problem.

MID-WEST ABRASIVE CO.

Manufacturers of DEPENDABLE Abrasives

OWOSSO, MICH. • DETROIT

ROCHESTER, PA.

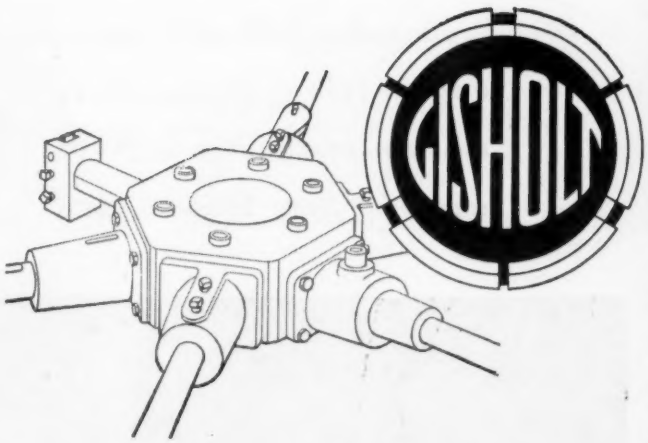
"There's *TWELVE* hours' work...completed in *EIGHT!*"

YES, the operators who knew the turret lathe of a few years ago will tell you that a 50% increase in production is not unusual for these new Gisholt Ram Type Machines.

Now, with many of the machine's functions made automatic, the simpler, easier operation of the modern Gisholts makes possible new standards of efficiency in turret lathe performance. With effortless selective automatic changing of spindle speeds, hydraulic clutching and braking, automatic indexing and clamping of the hexagon turret, and many other operating advantages, the new Gisholts have contributed much to the rapid production of essential war materials. And they will contribute a great deal more to the lowering of production costs in the postwar period.

Men responsible for increased production and lower manufacturing costs should obtain complete information about the new Gisholts.

GISHOLT MACHINE COMPANY
1201 East Washington Avenue • Madison 3, Wisconsin



Look Ahead . . . Keep Ahead . . .
With Gisholt Improvements
in Metal Turning

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

WHAT'S AHEAD FOR YOUR BUSINESS?

Find Out Today How EX-CELL-O'S Complete Parts Production Facilities Can Help You Meet Tomorrow's Tough Competition

With a complete organization under one responsible management . . . *an organization built upon years of varied engineering experience, modern machining methods and heat treat facilities, and practical inspection staffs* . . . Ex-Cell-O probably has the exact solution to the parts production problem you face.

Ex-Cell-O field engineering representatives will be very glad to talk it over with you.

SEE EX-CELL-O FIRST

EX-CELL-O's *facilities:*

PRODUCTION ENGINEERING

HEAT TREAT

Induction Hardening
Laboratory for Heat Treat Control Including Micro Examination and Photography
Atmosphere Control Continuous Hardening Furnaces
Atmosphere Control Box Hardening Furnaces
Various Types of Air-Draw Batch Type Furnaces
Gas Carburize Furnaces
Gas Carburize Furnaces
Pack Annealing Furnaces
Nitriding Furnaces
Cyanide, Lead, and Neutral Salt Pot Furnaces
High Speed Steel Atmosphere Control Vertical and Horizontal Hardening Furnaces
Continuous Air-Draw Furnaces

PRODUCTION MACHINES

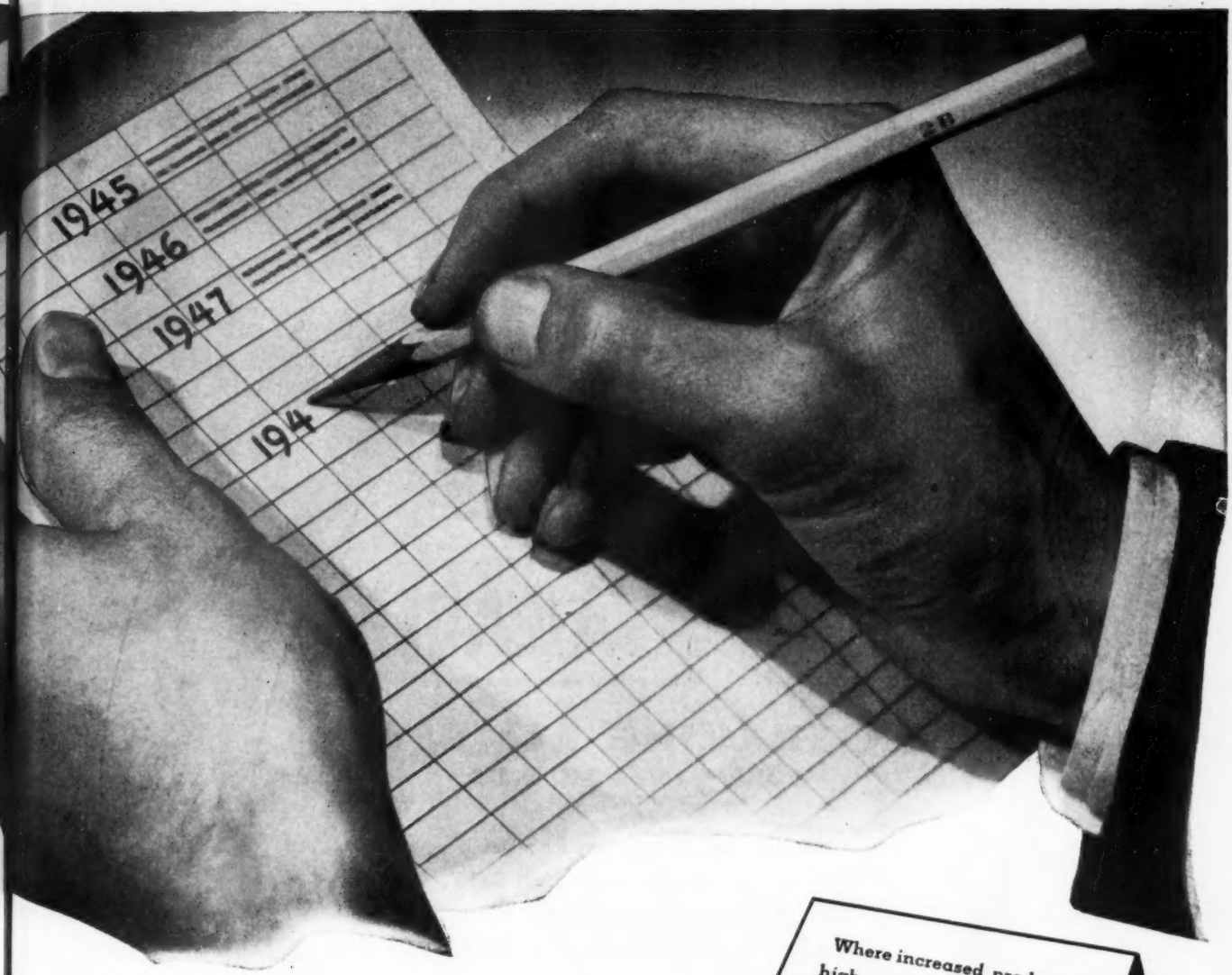
Multiple Vertical Turret Lathes
Multiple Spindle Automatic Screw Machines
Single Spindle Automatic Screw Machines
Hand Screw Machines
Centerless Grinders
Single and Multiple Spindle Drilling Equipment
Plain O.D. Grinders
Plain I.D. Grinders
Milling Machines
Broaching Machines
Precision Thread Grinders
Precision Boring Machines
Lapping Machines
Special High Production Equipment

UNIT ASSEMBLIES

For many years Ex-Cell-O has supplied large and small manufacturers with parts and has also supplied many parts in unit assemblies after machining, heat treating and grinding.

INSPECTION

Ex-Cell-O has always maintained that quality in a product is not the result of accident; that quality is built into a product by rigid adherence to accepted quality standards . . . standards that are upheld at Ex-Cell-O by efficient inspection at every step of the machining process.



Where increased production, high accuracy, and greater economy through multiple operations are required . . . See Ex-Cell-O First!

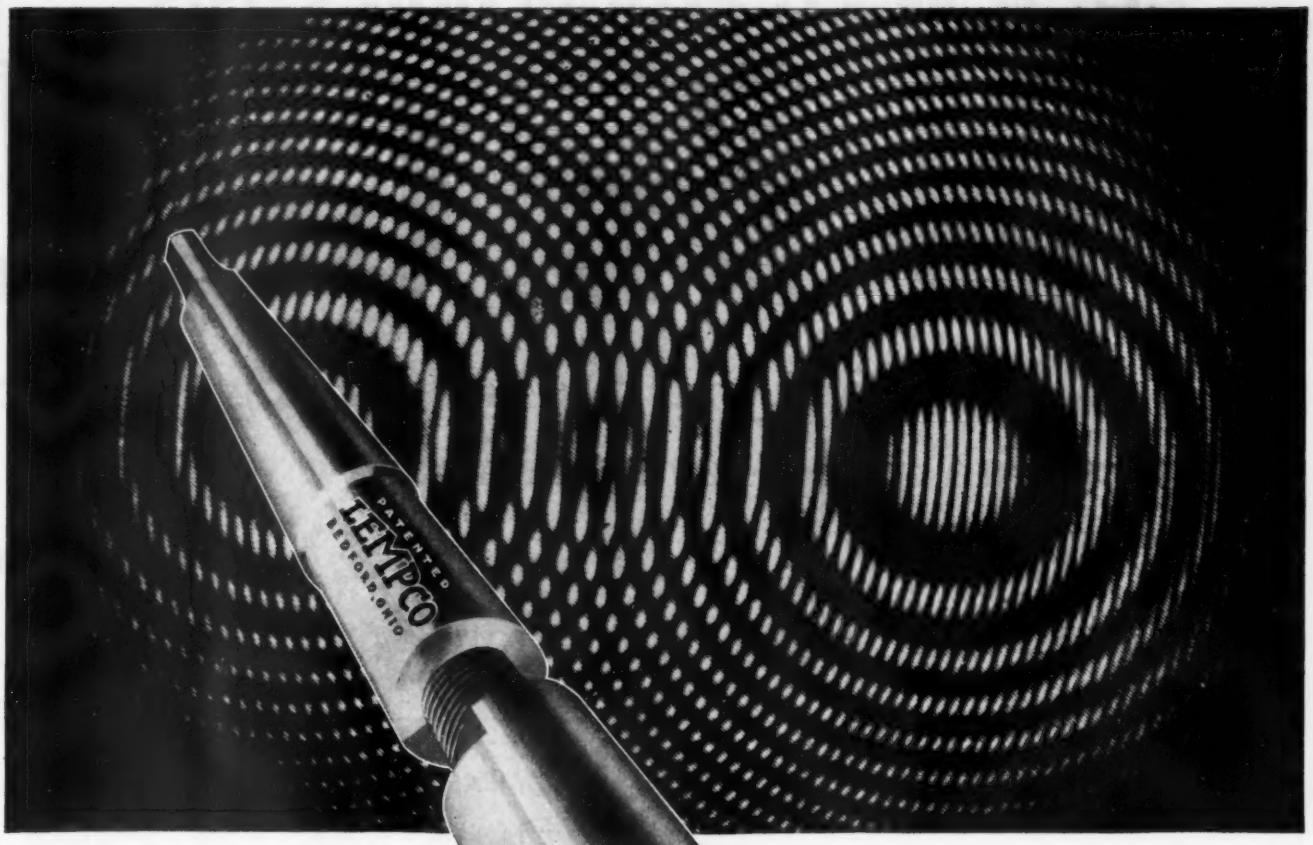
To left: **A sectional view of one of Ex-Cell-O's precision boring departments where miscellaneous production parts are turned, faced, bored, recessed to accurate measurements.**

XLO

EX-CELL-O *for* PRECISION

EX-CELL-O CORPORATION · DETROIT 6, MICH.

Shaves gears from 12" to 36" P. D., internal or external.
Shaves gears from 3/16" to 4" P. D.
Shaves gears from 1" to 24" P. D.
MACHINES
NOW AVAILABLE
FOR SHAVING ALL GEARS
3/16" to 220" P.D.
A complete line of Red Ring machines is now available for shaving gears from 3/16" to 220". The teeth of gears from 3/8" to 36" may be shaved to the Elliptoid form to eliminate "end bearing".
Shaves gears from 4" to 48" P. D.
Shaves gears from 24" to 120" P. D.
NATIONAL BROACH AND MACHINE CO.
5600 ST. JEAN • DETROIT 13, MICH.
SPECIALISTS IN SPUR AND HELICAL INVOLUTE GEAR PRACTICE
ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS
RED RING PRODUCTS



FINISH-REAMS MORE HOLES PER MAN-MINUTE!

THE PATENTED

LEMPCO

DUAL-SPIRAL EXPANSION REAMER

Right-hand flutes on two segments spiral counter to left-hand flutes on the third blade segment simultaneously. In this way a clean opposite-spiral shearing action is effected, and a satin-smooth surface is finish-reamed in one operation. Reams precision holes in magnesium, aluminum, bronze, zinc, steel, and all machinable alloys and plastics. .035" to .080" straight line expansion. Many exclusive, patented features. Write for complete description.

WRITE FOR CATALOG

LEMPCO

5711 DUNHAM RD. • BEDFORD, OHIO, U.S.A.

Your Weld Production Costs

CAN BE CUT!

HOW By replacing your present rotating type d-c machines with money-saving Ampac a-c welders.

WHY Because Ampac's lower power consumption offers you lower cost of operation!

ACTUAL COMPARISON TEST TELLS THE STORY

Here are the results of an actual test made to compare the performance of an a-c transformer type welder against a typical d-c motor-generator unit. Both machines were tested under identical conditions and both units were regulated to deliver the same welding power output.

1. MACHINES COMPARED:

AMPAC AC DC UNIT

A leading 200 ampere d-c motor-generator type welder . . . and an Ampac 200 ampere a-c welder.

2. KW INPUT TEST:

AMPAC AC DC UNIT

(Same current output and using same type electrode) . . . d-c welder averaged 9.3 kw . . . Ampac "200" averaged 5.2 kw.

3. IDLING LOSS TEST:

AMPAC AC DC UNIT

The d-c unit showed an idling rate of 1.63 kw . . . economical Ampac "200" had idling rate of only .09 kw.

4. THUS:

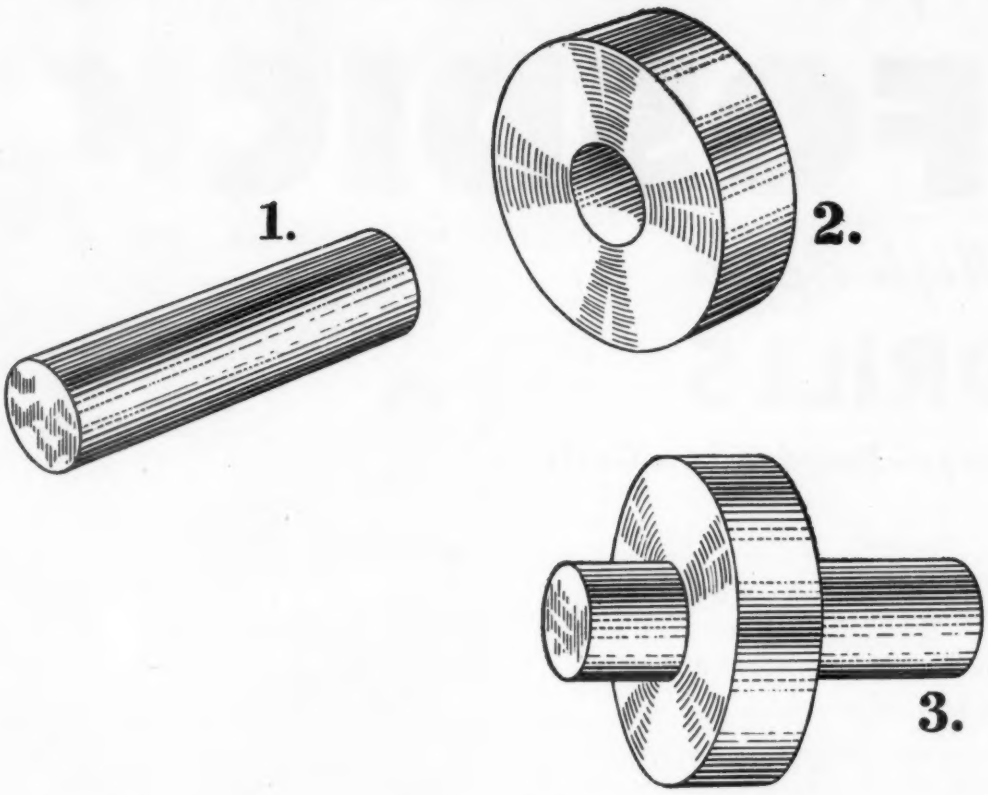
Allis-Chalmers a-c welder — Ampac "200" — delivered the same welding power current as the d-c machine although drawing only 56% as much current from the power lines. And Ampac had but 6% of the d-c unit's idling loss! Definite proof that weld production costs can be cut by switching to money-saving Ampac welders.

A 1921

PRODUCTION WELDING with its time-saving method of fabrication is playing an important part in the post-war era. But *reduction* in cost is vital. For postwar markets mean *stiff competition.* Allis-Chalmers offers economical Ampac "200" and "400" a-c welders as an aid to low cost production welding. Get full details on the complete A-C welding line — including electrodes and accessories — from our nearby welder dealer or district office. Or write to ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

ALLIS-CHALMERS

HEAR THE BOSTON SYMPHONY: *Every Saturday Evening, American Broadcasting Co.*



JOINED . . . *by degrees!*

FOR years, *heat* has been used to set collars firmly on shafts—to fit metal parts tightly together. But the high temperatures needed introduce the risk of loss of temper. Additional machining is often necessary.

Now *cold* does the same job . . . faster and better! Low temperatures, to minus 50—100F., cool and contract the inner part. When in place, room temperature secures a final fit. In this way, too, both parts are joined . . . by degrees!

Here is one of the many better, more economical industrial processes developed through refrigeration. G-E equipment has contributed to such applications as treating aluminum rivets to retard ageing, the stabilization of metals, and in other ways controlling the behavior of metals and materials through the use of low temperatures.

This may suggest important ways to improve *your* production. When you want the best in air conditioning and refrigeration . . . see G.E. first! *General Electric Company, Air Conditioning Department, Section 56911, Bloomfield, New Jersey.*

BUY . . . and hold . . . VICTORY BONDS

GENERAL ELECTRIC

Industrial Refrigeration

Put your small hole drilling on FOSDICK

High Speed
DRILLS

for Accuracy — Speed — Low Costs

● Particularly in Tool and Die Shops have Fosdick High Speed Drills been used extensively for the accurate, rapid drilling of holes up to 1½ inch diameter.

The wide selection of feeds and speeds—the ease with which they are obtained—and the rigidity of construction suits this machine particularly to tool and die shop operation.

The two machines shown are typical and are being used in a tool and die shop. You will note one machine is set up for capacity holes while the other is drilling smaller holes in a different part.

Although hundreds of these are—and have been—used in war production they are instantly convertible to peace time operation. In many cases this change-over does not require additional expenditure for tools or mechanical changes in the machine itself. Fosdick High Speed Drills are furnished single spindle models as shown or in gangs up to six spindles on a common base for progressive operations.

Full detailed description and construction features available in High Speed Drill Bulletin H.S.A. Write for yours. No obligation.

A tip on buying
SURPLUS MACHINE TOOLS

When you consider the purchase of a Fosdick Radial Drill—Jig Borer—or High Speed Drill from Surplus stores be sure of these points:

1. Its age
2. Its condition
3. Its tool equipment
4. Its price

We will be glad to furnish date any Fosdick Machine was built and give you information as to tooling originally furnished. Also remember that even the best of the used tools are considerably behind in the improvements of today's machine tools.

Feel free to consult us on any Fosdick Machines you contemplate purchasing from surplus. Our chief interest is in seeing that you get maximum value whether purchasing a new machine from us or a used one from surplus.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

It is reported that . . . . . .

"Liquid Envelope" is the new commercial coating that has been used to protect fighter planes in shipment. It may be sprayed, dipped or brushed, hot or cold. *Better Finishes & Coatings, Inc., Newark, New Jersey.*

get ready with CONE for tomorrow

Three iron companies are cooperating in a joint photographic aerial survey of the Marquette Range as an aid to more detailed exploration. *Engineering & Mining Journal.*

get ready with CONE for tomorrow

A new electrical instrument is said to be so sensitive that it can measure movements as small as one ten-millionth of an inch without touching the object. *Battelle Memorial Institute.*

get ready with CONE for tomorrow

A scientific journal reports that a new type of mechanical refrigerator, employing a high-speed rotor as its only moving part, can produce temperature drops as great as 220 degrees and can, by modification, be used as a heat pump for such purposes as the heating of homes in winter. *Journal of Applied Physics.*

get ready with CONE for tomorrow

Stainless steel is being made for a black surface finish suitable for the bottoms of cooking utensils and for many applications where reflections or glaring light are a disadvantage. *Business Week.*

get ready with CONE for tomorrow

The announcement by one radio manufacturer of a new set not much larger than a package of cigarettes is expected to be followed by a rush of similar announcements by other manufacturers. *Sentinel.*

get ready with CONE for tomorrow

Prisoners of war are constructing a model of the Mississippi River drainage area to permit the study of complex problems of drainage for the co-ordination of flood control measures. *Engineering News Record.*

The Great Lakes Research Institute has been organized to do for these inland seas what the Woods Hole Oceanographic Institute has been doing for the Atlantic.

get ready with CONE for tomorrow

The Army is packing guns and other weapons and surplus material in steel or aluminum "cans", in an atmosphere of nitrogen, for storage. *Air Technical Service Command.*

get ready with CONE for tomorrow

Stainless steel can now be cut with an oxy-acetylene torch almost as easily as mild steel. *Air Reduction Sales Co., Rustless Iron & Steel Corp.*

To aid the war-to-peace reconversion of scientific research, the Senate's subcommittee on war mobilization recommends that Congress create a National Science Foundation as an independent government agency.

get ready with CONE for tomorrow

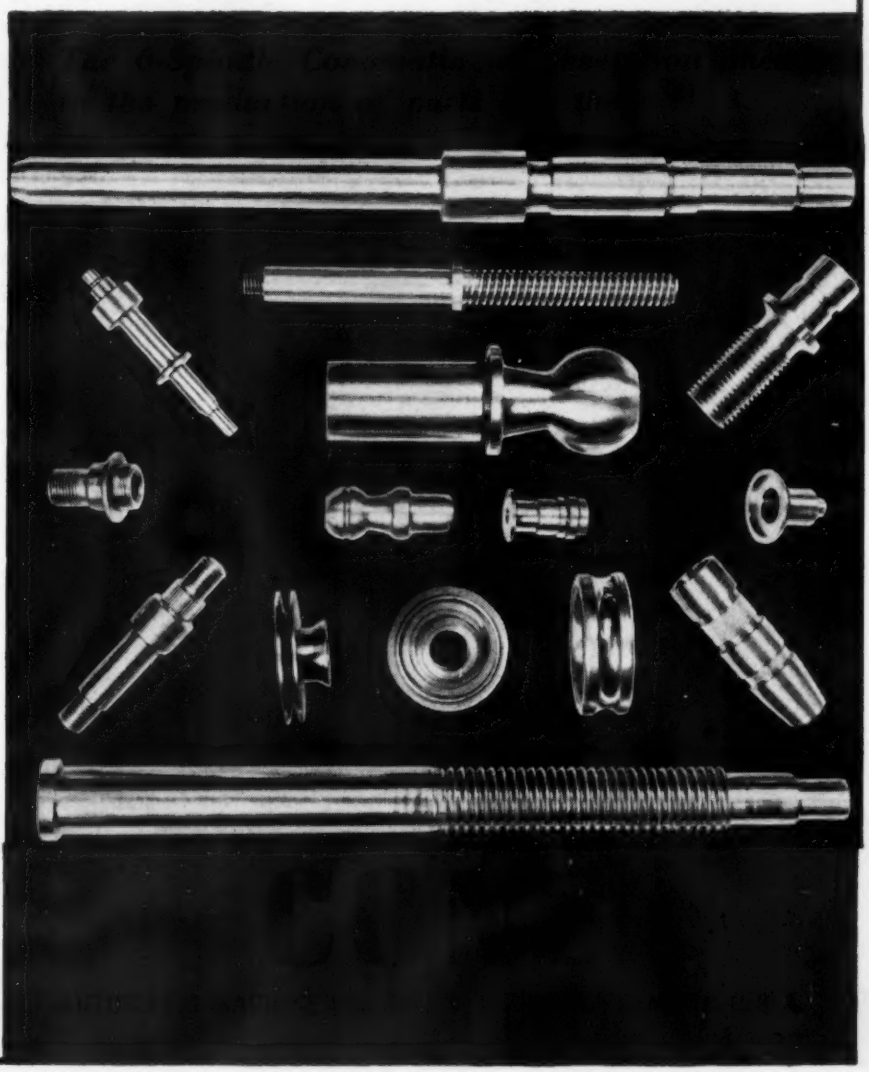
Power steering, which has been discussed speculatively for automobiles, is being used on one model of dump truck. *Heil Co.*

get ready with CONE for tomorrow

America's first jet-propelled plane is now a museum piece at the Smithsonian Institution. *Science News Letter.*

get ready with CONE for tomorrow

A new portable hardness-testing hammer is spring-operated and, being portable, can be used to test pieces of metal of any size, anywhere. *Steel City Testing Laboratory, Detroit.*



then he said to himself:

"Education Will Win"

OF all the heroic plans to raise the status of the people—simplest and most practical is that of Mexico's President Camacho. Says he—

"Each educated Mexican is to teach an illiterate Mexican to read and write."

The reason for this, he explains, is that we are going into a new world where education will win. Well he knows that the passing along of primary facts, from the instructed to the uninstructed, provides the toehold for education in any line.

Well he knows that education never hurts a man, if he is willing to learn a little something after he graduates.

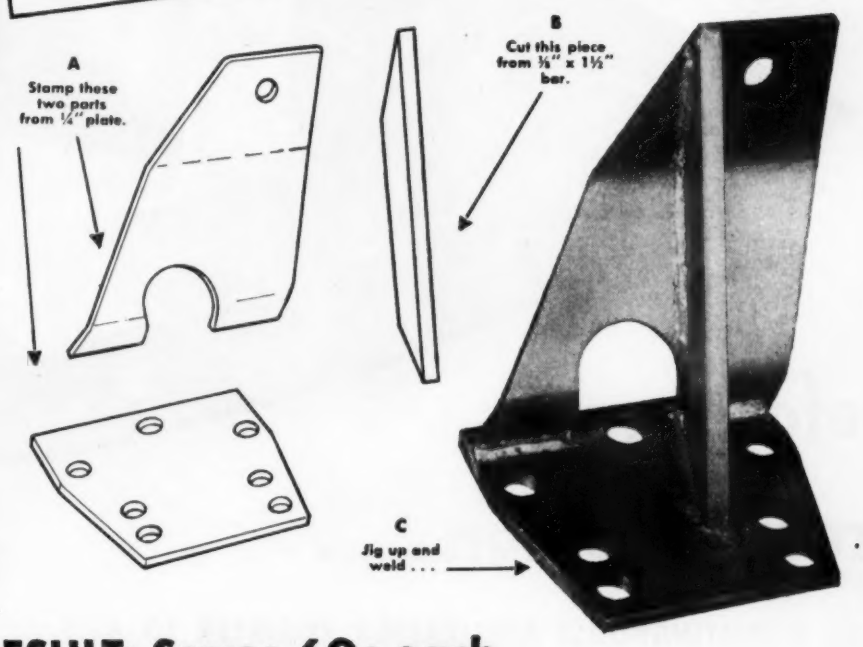
Well he knows the war was won by post-graduate thinking on production—by outsmarting outmoded procedures — through thousands of procedures such as—

"TEACH"—*he says*

HERE, PRESIDENT CAMACHO, is education for any man who wonders why he cannot sell his product, made by outdated procedures, against a competitive product which is arc welded *and come out with a profit.*

The A-B-C's of Welded Design

COSTS $1.24



COSTS 64c

RESULT: Saves 60c each

THIS bracket is typical of many parts being changed over to welded design to cut costs, and to produce a stronger, more rigid and lighter product . . . one that can be constantly improved easily and quickly.

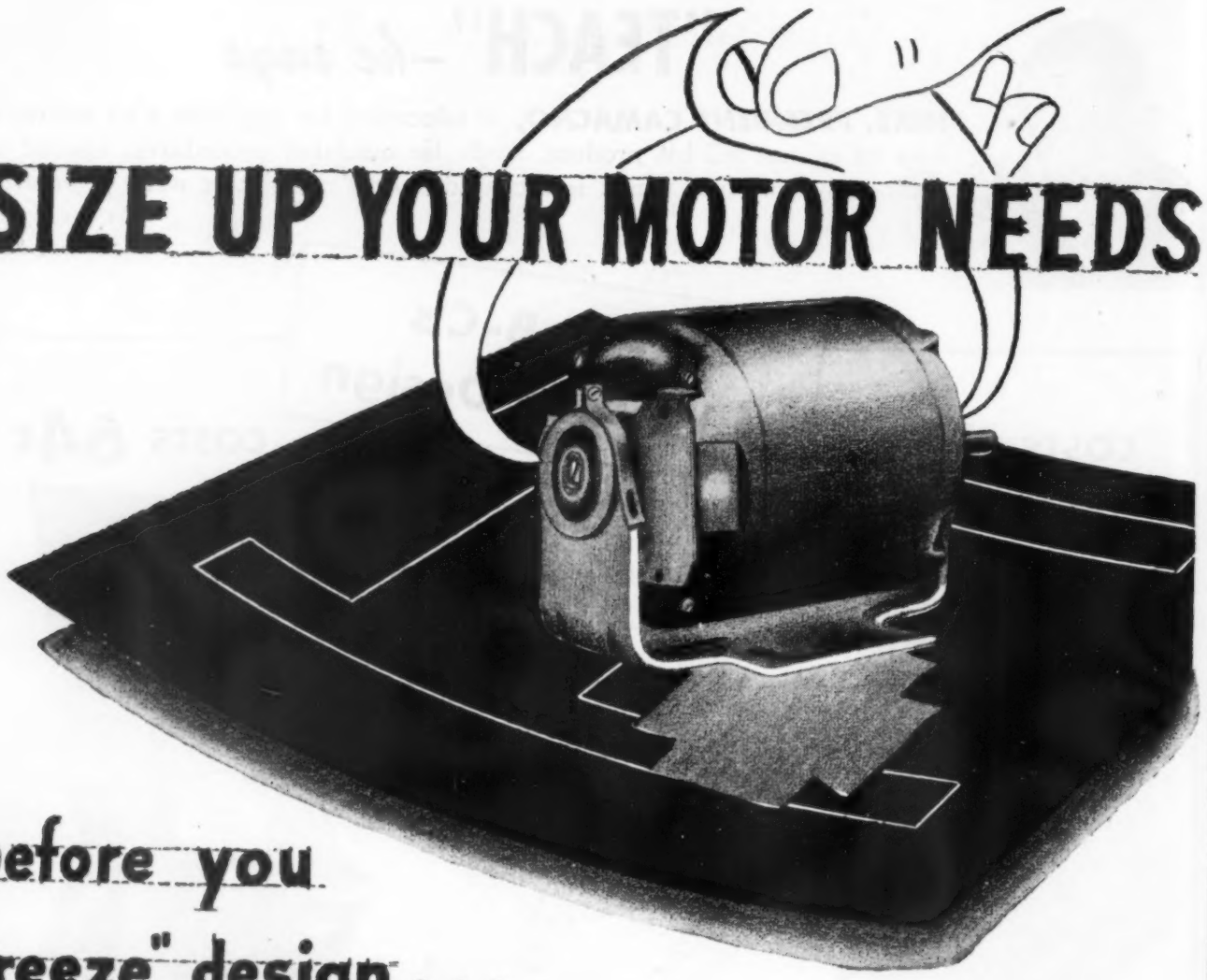
Here is the A-B-C solution to many of your problems of today. The Lincoln Engineer will gladly help you get the results *you* want. Studies in Machine Design free on request. Ask for them on your business letterhead.

THE LINCOLN ELECTRIC COMPANY • Dept. I-1 • CLEVELAND 1, OHIO

America's greatest natural **recourse**

ARC WELDING

SIZE UP YOUR MOTOR NEEDS



before you "freeze" design....

ASK A WESTINGHOUSE APPLICATION ENGINEER TO HELP

After the desigh is "frozen" and your apparatus is tooled, changes to accommodate the motor may be costly and time-consuming. Make certain you select the right motor before you go ahead with design. Make sure, too, that you use existing motor designs wherever possible, and avoid the extra cost of specially-engineered motors.

Standardized designs offer a number of advantages: lower cost, faster deliveries, reduced inventories and simplified servicing.

Westinghouse engineers have been applying fractional horsepower motors for decades, and have built into standard motors many special features to meet particular service requirements. Before you "freeze" design, ask for Westinghouse engineering help. Call your Westinghouse office or write Westinghouse Electric Corporation, Lima, Ohio. J-03227

MOTOR EXCHANGE PLAN PROVIDES

REPLACEMENT SERVICE IN 24 HOURS OR LESS

ANYWHERE IN THE UNITED STATES

Westinghouse Motor Exchange points in all principal cities can service most Westinghouse small motors of standard sizes in 24 hours, or less, anywhere in the United States. This service gives the appliance user an efficient, factory-rebuilt replacement motor in exchange for his old motor at a low, flat cost. Your nearest Westinghouse office will give you full details. Ask for bulletin B-3336.

Westinghouse

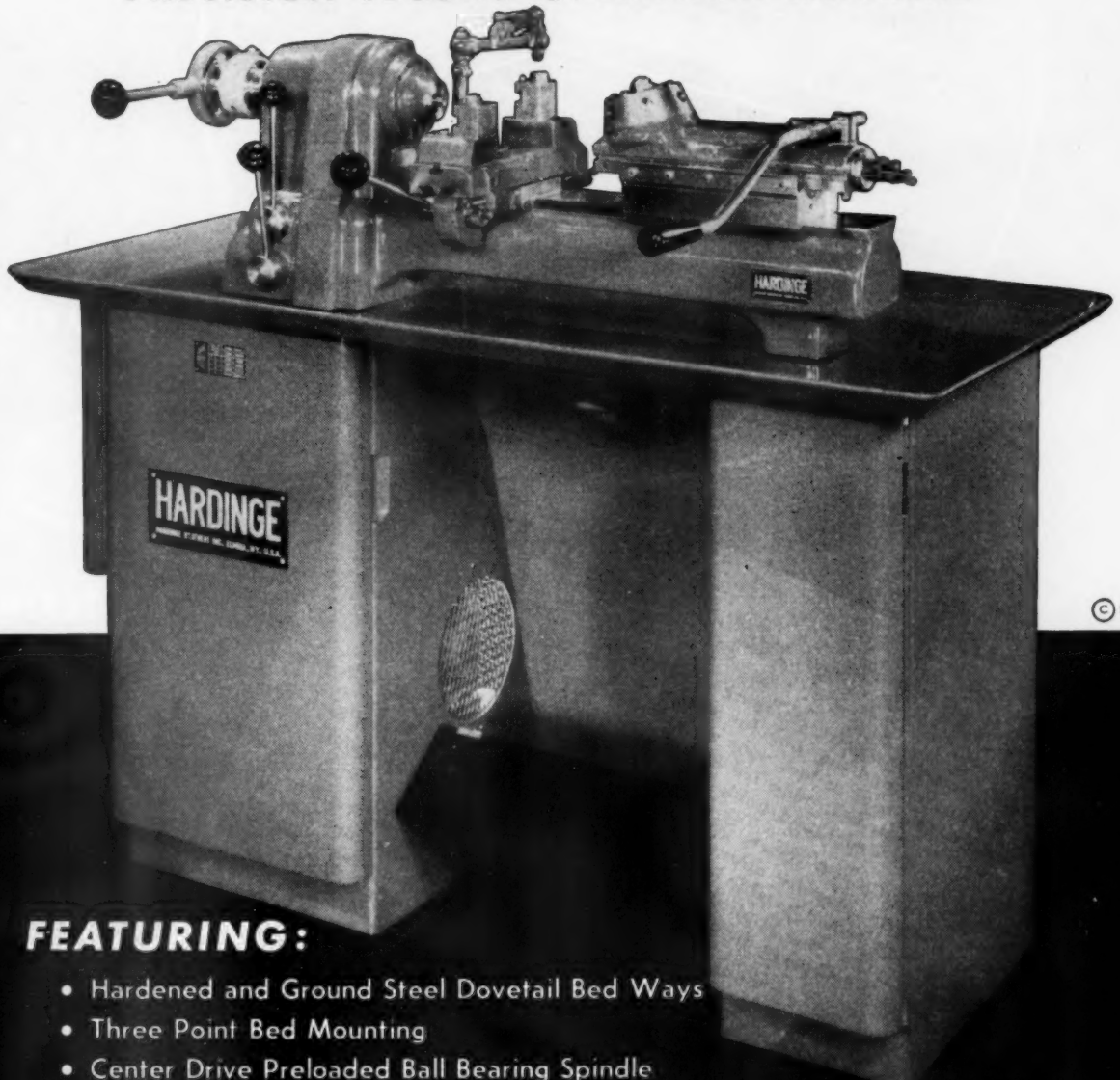
SMALL MOTOR DIVISION

HARDINGE
ELMIRA, N.Y.

ANNOUNCING A NEW MODEL

HIGH SPEED PRECISION LATHE

PRECISION SECOND OPERATION MACHINE



©1945

FEATURING:

- Hardened and Ground Steel Dovetail Bed Ways
- Three Point Bed Mounting
- Center Drive Preloaded Ball Bearing Spindle
- Hardened and Ground Steel Ways in Turret
- Preloaded Ball Bearing Turret Head
- Complete Built-in Electrical Equipment

Write for Bulletin DSM 59

HARDINGE
DOVETAIL BED
1" Collet Capacity – 9" Swing

HARDINGE BROTHERS, INC., ELMIRA, N. Y.
"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

LOCK JAW *Stops*

SLIDING

HEAVING

SHIMMYING

CHATTERING

YAWING

BUCKLING

HANDY *New All-Purpose* CLAMP

Eliminates expensive clamping and bolting operations. No more hunting around the shop for straps, bolts, washers, nuts or scrap pieces to wedge or lock your work in position. No oddly and awkwardly contrived, odd-sized and makeshift locks, limited in their ability to wedge and hold.

Now LOCKJAW gives you positive, powerful two-way locking, sure grip pressure downwards and side-ways. It may be set at any angle on the table and held by the T-slot bolt. Then LOCKJAW pressure is applied to one or more pieces of stock by simply adjusting Capstan Jack Screw.

Setting up or taking down is a quick and simple operation. Every machine shop, tool room, or metal working unit can find many handy uses for this new Rivett conceived clamp on their planers, radial drills, shapers, milling machines, surface grinders and boring mills.

You, too, will save time, trouble and inconvenience when you use LOCKJAW to eliminate cumbersome and awkward clamping.

RIVETT

RIVETT LATHE & GRINDER, Inc.

BRIGHTON • BOSTON • MASS. • U. S. A.

Now! an IMPROVED KENNAMETAL LATHE FILE

- *CUTS STEEL NO ORDINARY FILE CAN TOUCH*
- *PERMITS FILING SPEEDS 3 TO 10 TIMES THOSE POSSIBLE WITH STEEL FILES!*
- *OUTLASTS MILL CUT FILES 50 TO 200 TIMES*

This new Kennametal Lathe File retains all the time- and cost-saving characteristics of previous designs —*cuts steel up to 62 Rockwell C hardness; does outstanding job on cast iron and non-ferrous materials; permits filing operations at carbide tool turning speeds; produces superior finish.*

And now, in addition, it provides these new features — *longer filing surface; quick, easy blade replacement; greater handling convenience.*

The filing surface comprises two 4" long Kennametal blanks which have cylindrical nuts brazed to them, and are attached to the aluminum alloy handle by screws. After long service (up to 200 times that obtained from steel files) the blanks can be readily replaced.

The handle grip has a thumb rest and knuckle guard. An extension of the handle beyond the filing surface provides a secure finger hold. A hole in this extension permits the file to be hung up.

On the first production run, a Kennametal Lathe File usually saves its cost many times over. Order one—let it demonstrate to you an astonishingly low filing cost-per-piece.

Features

REPLACEABLE BLANKS

Kennametal blanks are attached by Phillips head screws. Two types are available: fine (30 teeth per inch); and coarse (20 teeth per inch).

LIGHT WEIGHT

Weighs less than one lb. Can be handled with ease, and used for long periods of time with minimum expenditure of energy.

HAND-FITTING GRIP

Handle is comfortable—it fits the hand; provides secure grip. Opposite end of file provides convenient finger hold.

SPECIFICATIONS AND PRICES

COMPLETE FILE		FILE BLANK—2 REQUIRED		
CAT. No.	PRICE EACH	CAT. No.	TEETH/ INCH	PRICE EACH
F-45*	$18.50	F-453	30	$7.50
		F-452	20	7.50

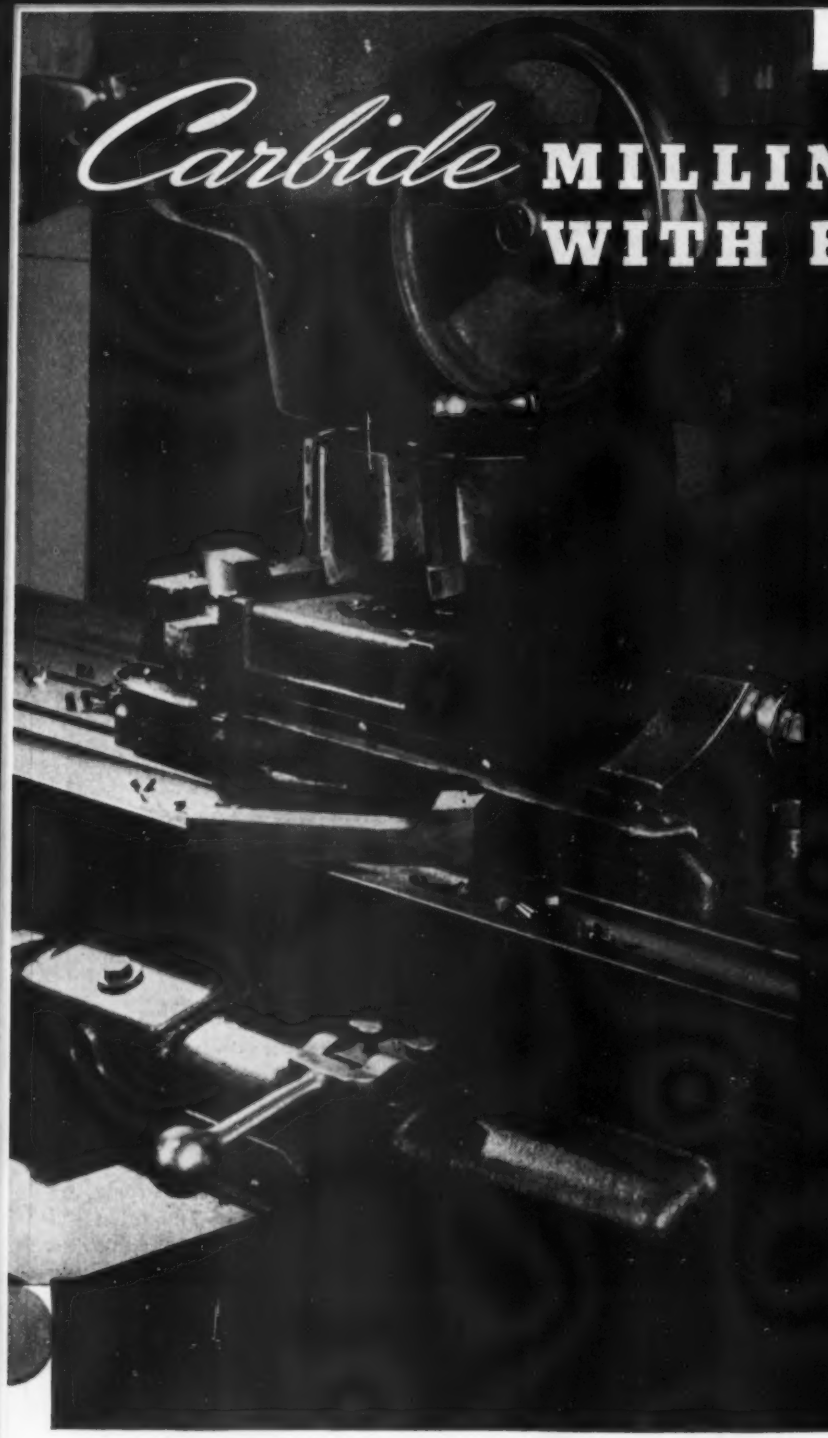
* Furnished with blanks having 30 teeth/inch unless otherwise specified.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL Inc., LATROBE, PA.

Carbide MILLING OF STEEL WITH EXCEPTIONAL



READ THIS PERFORMANCE REPORT:

The illustration shows an interesting high-speed milling operation performed on a vertical model CSM milling machine at the Wendt-Sonis Company, Hannibal, Missouri.

The work-piece is S.A.E. 1095 steel, hardness 18 Rockwell C. 4½ cubic inches of metal are removed in only two passes; the first cut is 7/16 inch deep, the second 5/16 inches deep. The finish on the cut metal is unusually good. An 8 inch 6 blade Wendt-Sonis face milling cutter is used for the operation, running at 342 rpm (682 sfm) with a table feed rate of 17½ inches per minute.

Concerning the performance of the CSM milling machine, Mr. Del Rhino, Wendt-Sonis Plant Superintendent, enthusiastically says "We have increased our production eight to ten times over our previous method of milling this workpiece. We have experienced similar increase in the production rate on other jobs we have milled with this machine. We are not alone pleased with the performance of the CSM machine but also with its ease of operation."

REPRESENTATIVE USERS OF THE KEARNEY & TRECKER 50hp CSM MILLING MACHINE

GLENN L. MARTIN COMPANY
- - Middle River, Baltimore City, Maryland

BOEING AIRCRAFT — for Iron Fireman
- - 4784 S. E. 17th Avenue, Portland, Ore.

DEFENSE PLANT CORP.
- - - Fisher Body Division, Flint, Michigan

IRON FIREMAN MFG. COMPANY
- - 4784 S. E. 17th Avenue, Portland, Ore.

WENDT-SONIS COMPANY - - Hannibal, Missouri

GENERAL AIRCRAFT EQUIPMENT COMPANY
- - - - - - - South Norwalk, Conn.

KENNAMETAL, INCORPORATED - - Latrobe, Penn.

CHANCE VOUGHT AIRCRAFT,
- Div. of United Aircraft Corp., Stratford, Conn.

MATTISON MACHINE WORKS - - Rockford, Illinois

A. O. SMITH CORPORATION - Milwaukee, Wisconsin

CATERPILLAR TRACTOR COMPANY - Peoria, Illinois

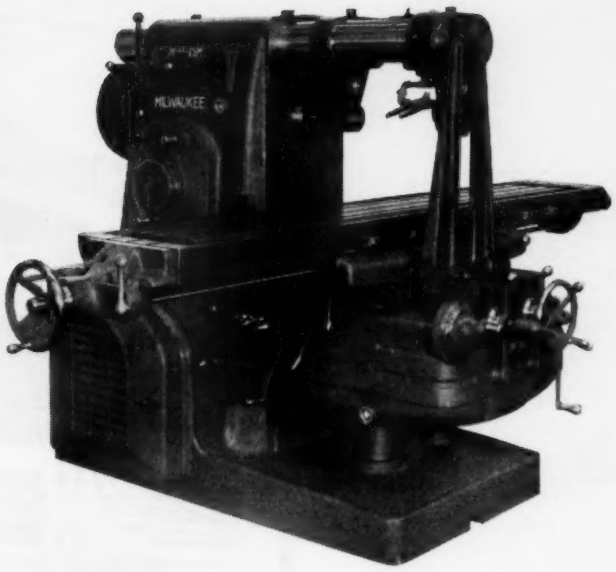
LANDELIUS & BJOERKLUND - - Stockholm, Sweden

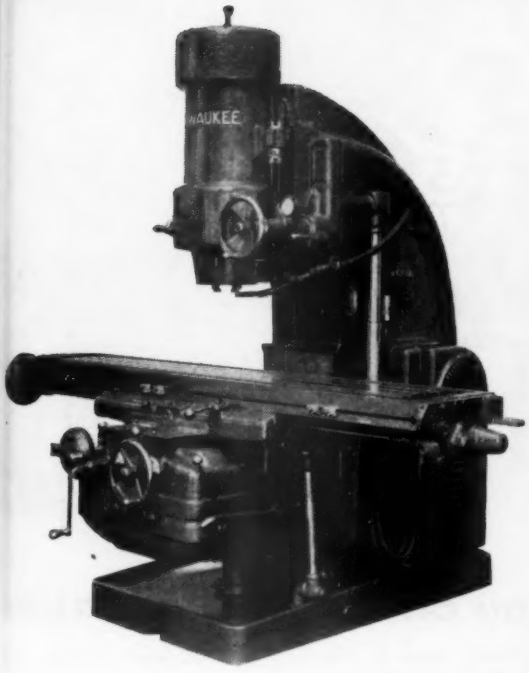
INGERSOLL MILLING MACHINE COMPANY
- - - - - - - - - - Rockford, Illinois

KEARNEY & TRECKER CORPORATION

. . . AT *HIGH SPEED* . . .
EASE OF OPERATION

THE KEARNEY & TRECKER 50 hp CSM MILLING MACHINE





The 50 hp CSM is an all purpose milling machine, specially engineered and built to meet the demands of Carbide Steel Milling—a comparatively recent development in high speed milling. It is a rugged, massive machine having great rigidity and equipped with ample power for the increased rate of metal removal made possible through the application of carbide cutters.

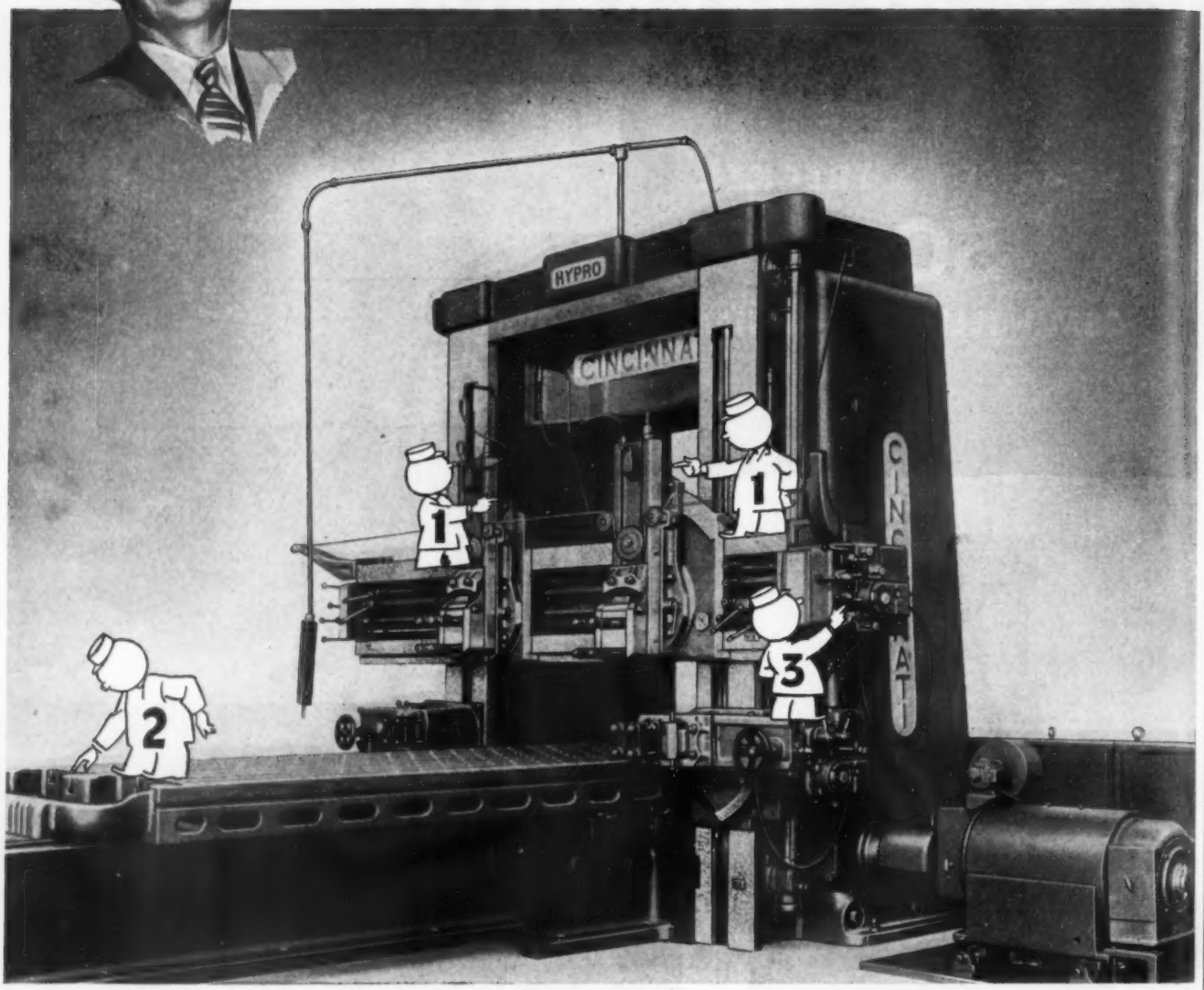
A heavy flywheel, mounted on the spindle, assists in providing and maintaining a uniform flow of power to the spindle. Direct power to the gear trains in the saddle and knee is supplied by a 5 hp motor mounted on the side of ıe knee. Speed changes and cutter positioning are facilitated by means of a conveniently accessible electric inching button. An electric spindle brake provides for almost instant stopping of the spindle.

Designed and constructed expressly to meet modern demands for increased high-speed production the CSM milling machine will not only handle carbide steel milling operations with ease and speed but also regular and heavy milling jobs to perfection.

If you are responsible for milling operations in your plant we would be glad to place your name on our mailing list to receive current data on metal cutting, as issued from time to time. Write on your business letterhead for "Metal Cutting Research Data."

MILWAUKEE 14, WISCONSIN

—and no other planer has these PATENTED ADVANTAGES



ONLY HYPRO PLANERS give you all these advantages

1—Hypro Pneumatic Tool Lifters

With a new patented cam and snubber arrangement, the Cincinnati Hypro Pneumatic Tool Lifter provides uniform acceleration and deceleration, with soft reseating action, of the Tool Block. The setting of the tool is not disturbed, which is especially valuable on finish cuts.

2—Hypro Renewable Steel Inserts in Table T-Slots

Hypro Table T-Slots are fitted with renewable steel inserts, protecting the original condition of the T-Slots and Table throughout the life of the machine.

Removal of work chips is more easily accomplished as they will slide freely on the smooth steel inserts.

3—Hypro Electric Dial Feeds

Independent feed changes are provided for the Rail and Side Heads. Feed is set instantly by the operator. A partial turn of star knob unlocks and changes feeds. When released, feed dial is automatically locked. Feed for any head may be changed at any position or direction of the table and fed at either end of stroke.

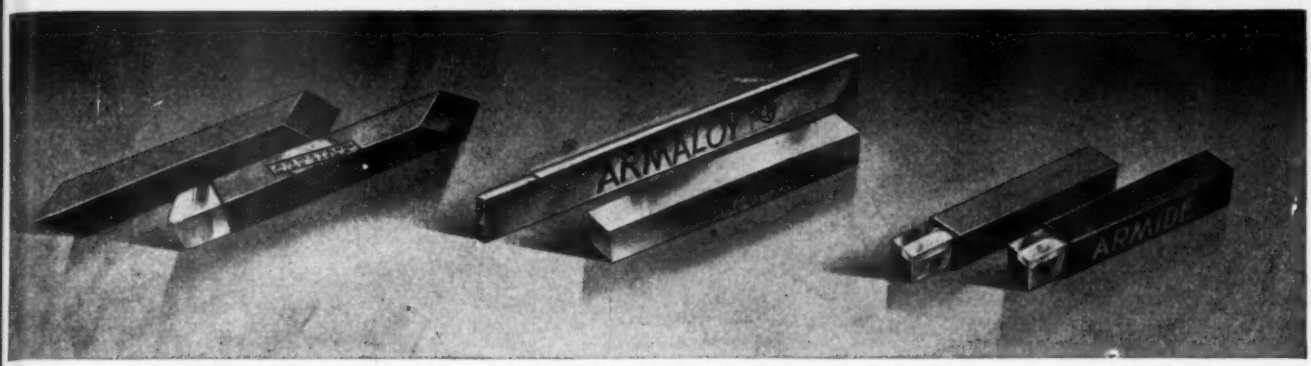
All pins, pawls, ratchets and other parts subject to wear have been eliminated, providing long life and minimum servicing for this mechanism.

THE CINCINNATI HYPRO PLANER COMPANY

PLANERS · BORING MILLS · PLANER TYPE MILLERS

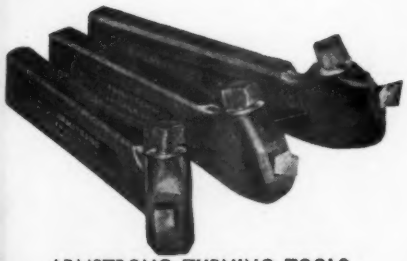
CINCINNATI, OHIO

ARMSTRONG

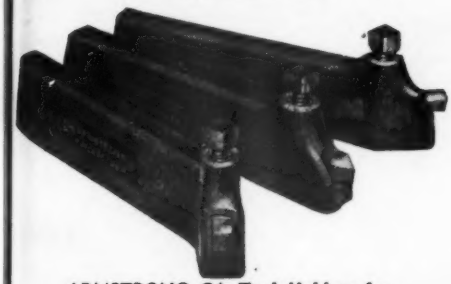


100-150 f.p.m. **200-300 f.p.m.** **300-600 f.p.m.**

Whatever the Cutting Speed . . .



ARMSTRONG TURNING TOOLS
for High Speed Bits



ARMSTRONG CA Tool Holders for
ARMALOY Bits

ARMSTRONG Tool Holders
for ARMIDE Cutters

Whatever cutting speed an operation calls for there is a correct ARMSTRONG TOOL HOLDER that takes the proper bits, blades or cutter to do the operation economically and efficiently.

ARMSTRONG HIGH SPEED

For general tool room and machine shop use, ARMSTRONG HIGH SPEED Bits and Blades are unsurpassed. They will stand up to speeds and feeds far greater than those generally accepted as "standard".

ARMALOY

ARMALOY Bits and their corresponding ARMSTRONG CA TOOL HOLDERS are recommended for machining sand-fitted castings, malleable iron, non-ferrous metals, rubber, plastics and for machining steel on modern high production machines, where sufficient speed and feed can be obtained to take advantage of their greater cutting capacity.

ARMIDE

ARMIDE Carbide-Tipped Cutters and ARMSTRONG Carbide Tool Holders, make the use of Carbide-tipped tools practical in even the smallest shop. Coming in two grades ARMIDE Red (for steel) and ARMIDE Gray (for cast iron, brass, aluminum and non-ferrous materials). They easily machine hard and tough steels, and stand up to the highest speeds and heaviest feeds, and increase the interval between tool re-grindings as much as 10 to 50 times.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

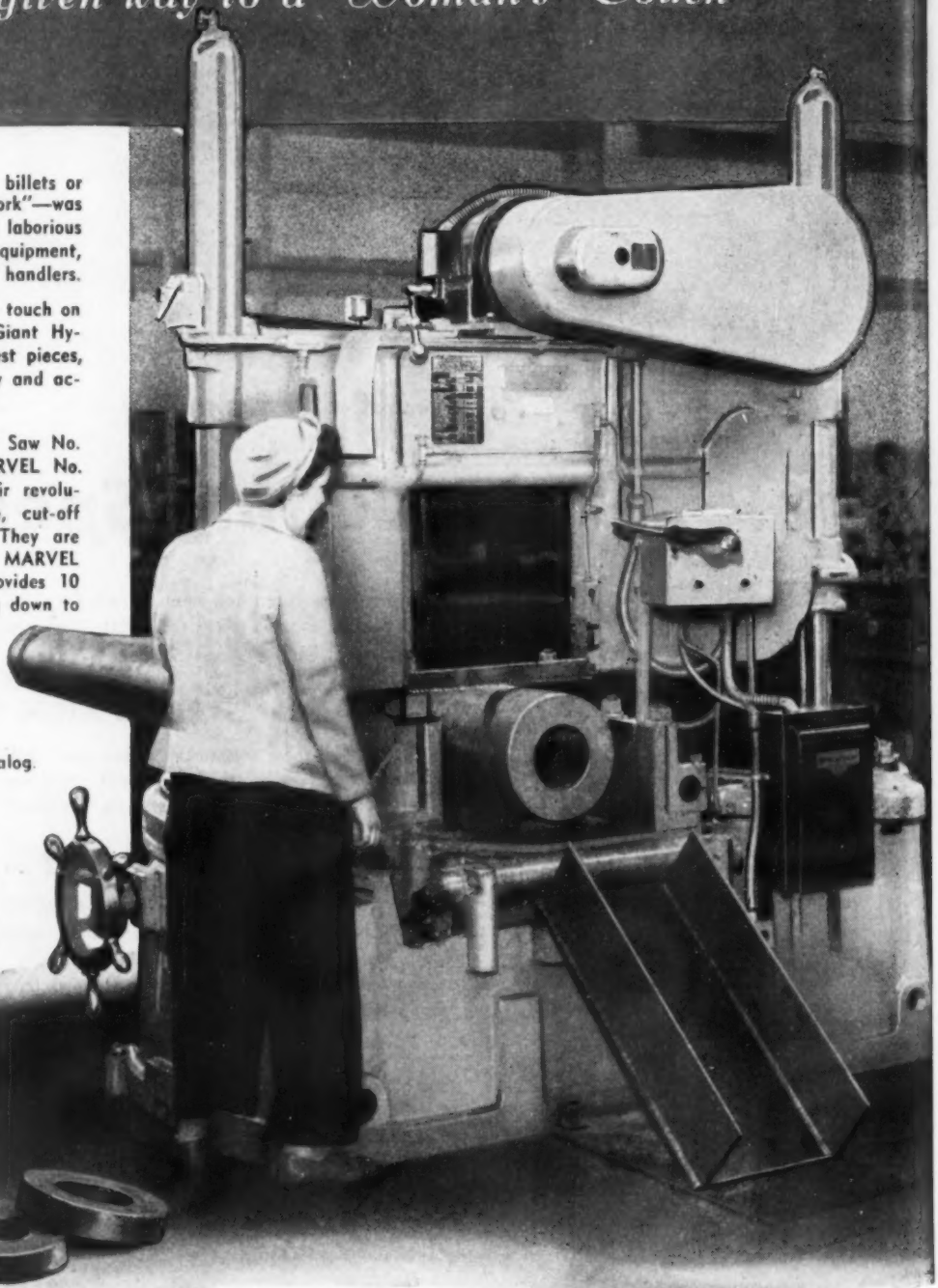
315 N. FRANCISCO AVENUE **CHICAGO 12, U. S. A.**

Eastern Warehouse & Sales: 199 Lafayette St., New York 12, N. Y.
Pacific Coast Warehouse & Sales Office: 1275 Mission St., San Francisco 3, California

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

THE SINEWS OF THE ARMORER

have given way to a Woman's Touch



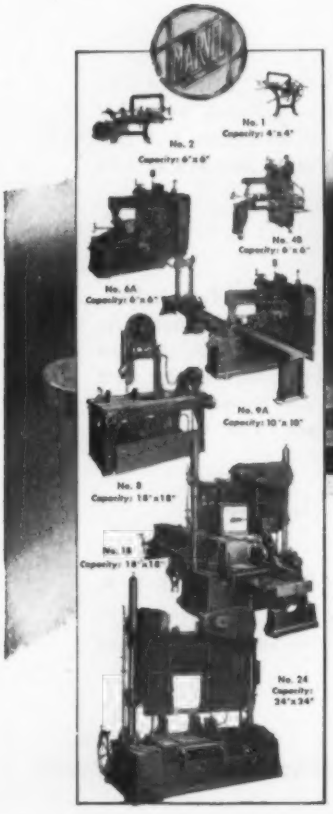
The cutting-off of really large bars, billets or forgings has always been "man's work"—was a slow, costly series of tedious and laborious operations requiring the heaviest equipment, and a crew of sweating and straining handlers.

How different today when a woman's touch on the control button of a MARVEL Giant Hydraulic Hack Saw cuts off the largest pieces, and cuts each to exact size squarely and accurately.

The MARVEL Giant Hydraulic Hack Saw No. 18, capacity (18" x 18") and MARVEL No. 24, capacity (24" x 24") with their revolutionary "roll-stroke" cutting action, cut-off the toughest and hardest steels. They are the larger units in the complete MARVEL System of Metal Sawing, which provides 10 different types of hack saws ranging down to small economical dry-cutting shop saws. In the MARVEL SYSTEM you will find a saw exactly suited to your needs—in each

See full description in Sweet's

See full description in Sweets Mechanical Files or write us for Catalog.



ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 BLOOMINGDALE AVE. CHICAGO 39, U.S.A.

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

MARVEL SAWS

Case Histories

Pictorial booklet explains THOMPSON TRUFORMING

. . . production with COMPLETELY ENGINEERED Crush Form Contour Grinders

THE fully automatic Crush Form Contour Grinder, illustrated above, is one of the (Thompson Truform) surface grinders *completely engineered* as a unit and built by the Thompson Crush Form Contour Grinding Development Laboratory to mass produce a complicated precision contour. The complete story of this application, together with the development of a semi-automatic (Thompson Truform) machine for job-lot contour production and regular surface grinding, is included in a new 16-page pictorial book, entitled "Facts About Crush Form Grinding Precision Contours." This book, the first of its kind, is a result of ten years of pioneering research and engineering by THE THOMPSON GRINDER COMPANY, SPRINGFIELD, OHIO.

Get these facts today!

Crush-Form-Contour-Grinding
Development Laboratory
The Thompson Grinder Company, Inc.
Dept. 10, Springfield, Ohio

Gentlemen: Please send me the 16-page pictorial book of facts about crush-form contour grinding on completely engineered surface grinders (the process known as Thompson Truforming).

NAME_____

POSITION_____

COMPANY_____

ADDRESS_____

CITY_____

ZONE_____ STATE_____

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MIDVALOY STAINLESS BARS

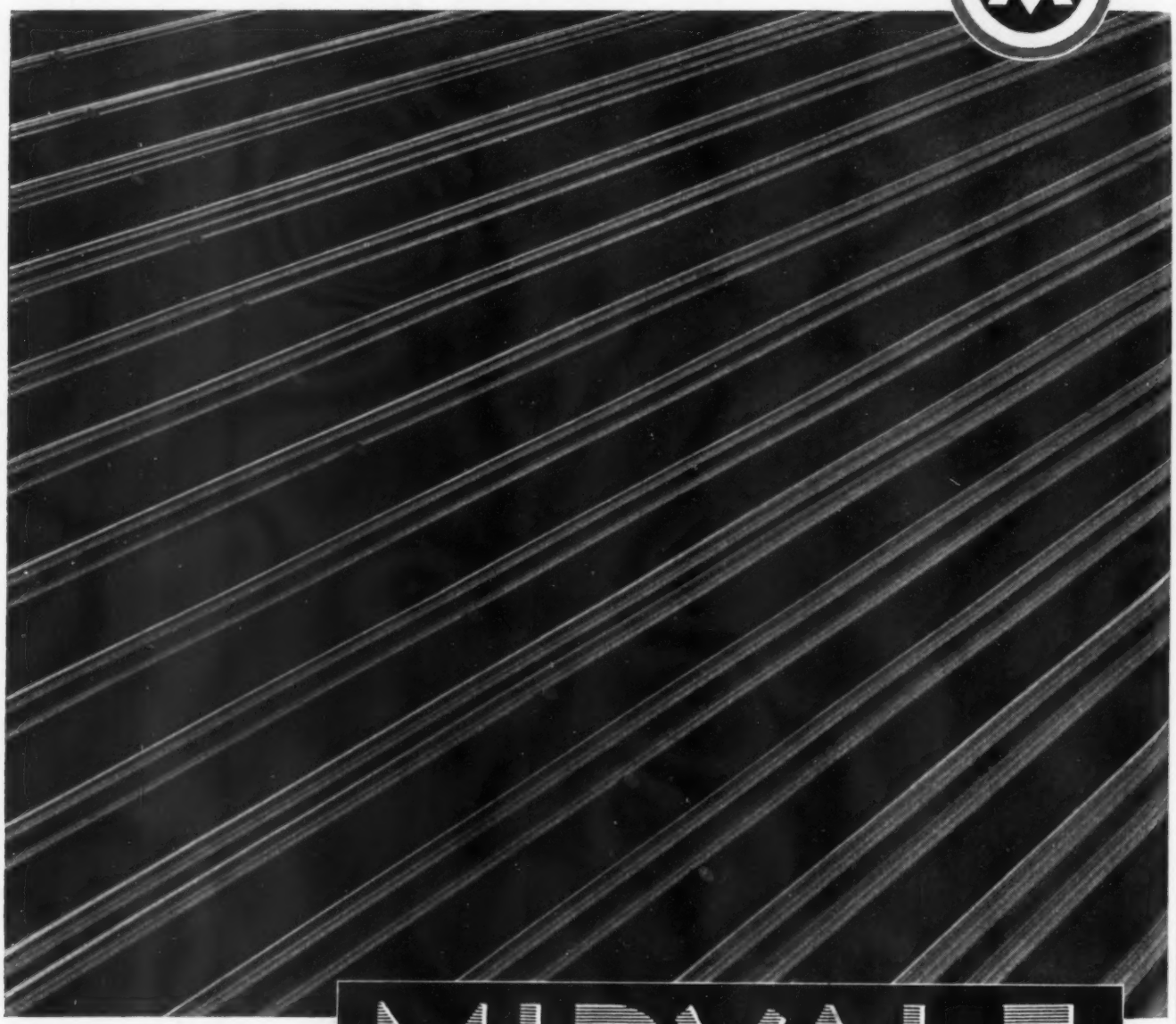
The rapidly expanding market for stainless steel products has called for the production of many types of stainless steel bars.

Midvale's long years of experience in manufacturing fine bar steels has proved to be of inestimable value, particularly when meeting requirements for special types about which little was previously known.

Midvaloy stainless steel bars regularly produced include all the usual types in the three principal groups — Chromium Nickel, Non-Hardenable Straight Chromium and Hardenable Straight Chromium — as well as many special types for special purposes.

THE MIDVALE COMPANY • NICETOWN • PHILADELPHIA

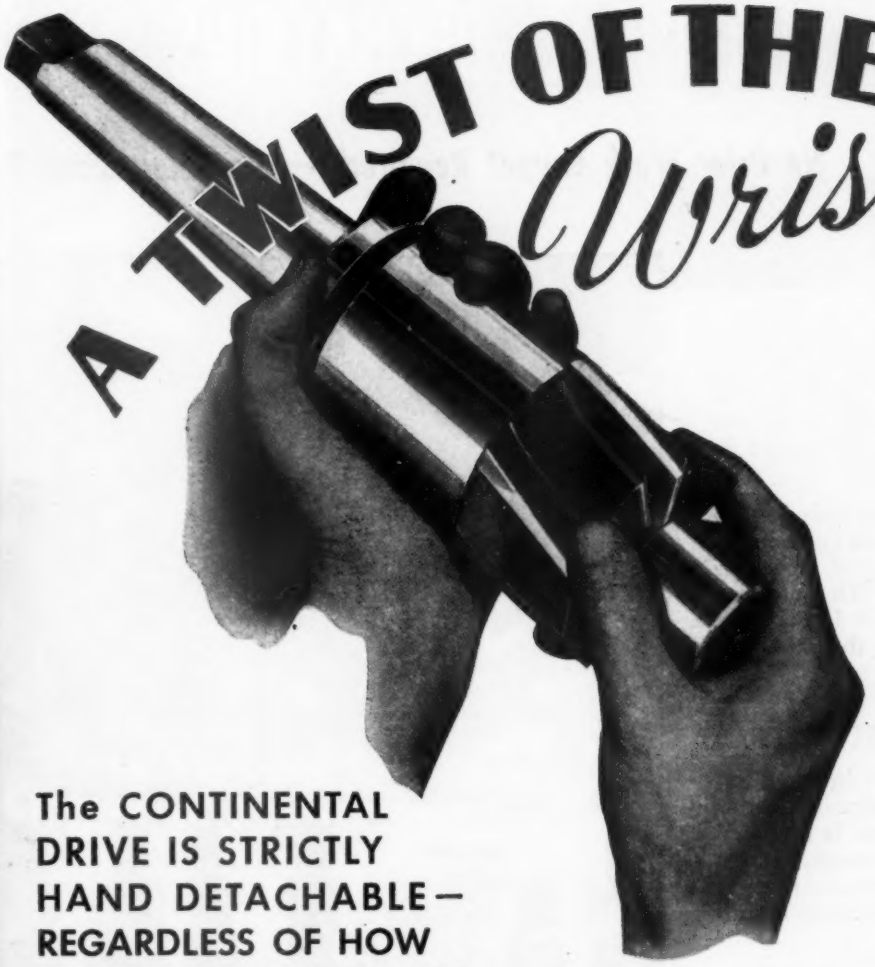
OFFICES: NEW YORK • CHICAGO • PITTSBURGH
WASHINGTON • CLEVELAND • SAN FRANC'SCO



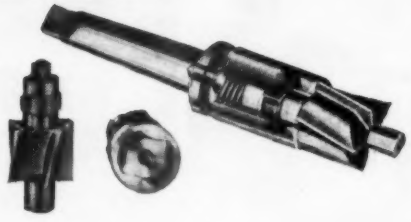
MIDVALE

Custom Steel Makers to Industry

A TWIST OF THE *Wrist*



The CONTINENTAL DRIVE IS STRICTLY HAND DETACHABLE—REGARDLESS OF HOW SEVERE THE OPERATION HAS BEEN



With an ever-widening range of practical uses, the Continental Counterbore is proving a favorite standard cutting tool in all types and sizes of machine shops. Of rigid and simple construction, with patented features, it has long been outstanding in American industry. There's a reason: Note in illustration at left the Continental indestructible drive. It is composed of two driving lugs formed on the cutter shank, with two corresponding abutments on the inside of the holder. There is an aligning bearing above and below the driving lugs that brings the cutter and holder concentric, and prevents the cutter from being forced out of alignment. The cutter and holder are engaged and disengaged by revolving the cutter a quarter turn *by hand.* No tools or equipment are necessary.

CONTINENTAL TOOL WORKS

Division of Ex-Cell-O Corporation

DETROIT 6, MICHIGAN

CONTINENTAL TOOL WORKS

CTW

EX-CELL-O CORPORATION

Continental

CUTTING TOOLS

- Boring Bars and Tools
- Broaches Broach Pullers Broaching Fixtures
- Core Drills
- Counterbores and Countersinks
- CTW Drive Holders
- Counterbores (Tool Room Sets)
- Counterbore Pilots
- Inserted Blade Cutters
- Carbide Tipped Cutters
- Form Relieved Cutters
- Milling Cutters
- Thread Milling Cutters
- End Mills
- Side Mills
- High Speed Steel Reamers
- Carbide Tipped Reamers
- Shell Reamers
- Inverted Spotfacers
- High Speed Steel Tool Bits
- Carbide Tipped Tool Bits
- Circular Form Tools
- Cut-off Tools
- Flat Form Tools
- Dovetail Form Tools

45-46

215 INDIVIDUAL OPERATIONS MADE IN

No Prior Work Layout Required—Machining Simplified

■ Twenty-four surfaces are milled, 100 holes are drilled, 37 bored, 35 tapped, 10 reamed, 8 faced and one counterbored on a planer type G. & L. machine to complete this huge revolving frame for final assembly. All operations are performed in only three settings.

Machine scales and verniers are depended upon entirely to locate all dimensions which are held to .002" between bore centers and on pad faces. *No preliminary layout work is required.* The massive weldment is taken directly to the G. & L. machine after fabrication and is mounted on the table for machining operations.

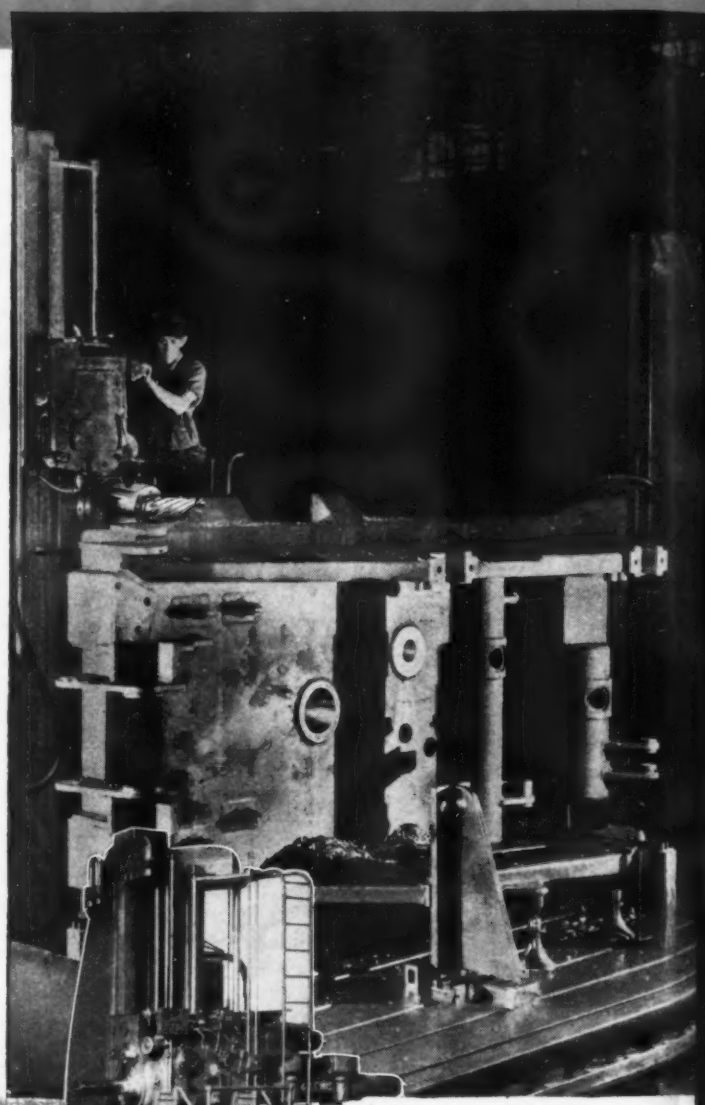
PROFILING USED TO MACHINE CIRCULAR PAD

G. & L. headstock and table feeds used in combination make it possible to profile the circular roller path without difficulty. Headstock feed is engaged simultaneously with table feed. As a result of this compound feed movement, the cutter mills the circular path of the roller pad to the required dimensions.

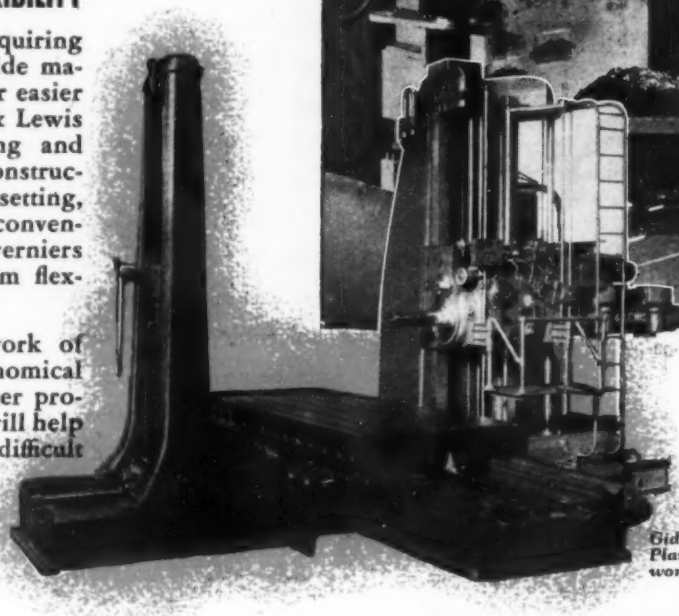
MAXIMUM MACHINE FLEXIBILITY

Large complex work requiring multiple operations and wide machining range is handled far easier and better on a Giddings & Lewis Horizontal Boring, Drilling and Milling Machine. Open construction, simplicity of work setting, accuracy of operations and conveniently located scales and verniers give this machine maximum flexibility and versatility.

If you are producing work of this kind and seek an economical and practical means to better production, G. & L. engineers will help you analyze and solve your difficult machining problems.



Planer Type Giddings & Lewis Horizontal Boring, Drilling and Milling Machine.

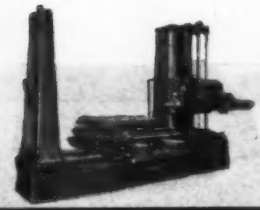


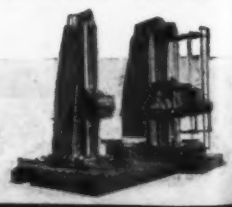
Giddings & Lewis 360-P Planer Type Machine with work mounted on table.

GIDDINGS & LEWIS

138 DOTY STREET

Right: G. & L. Table Type Machine.

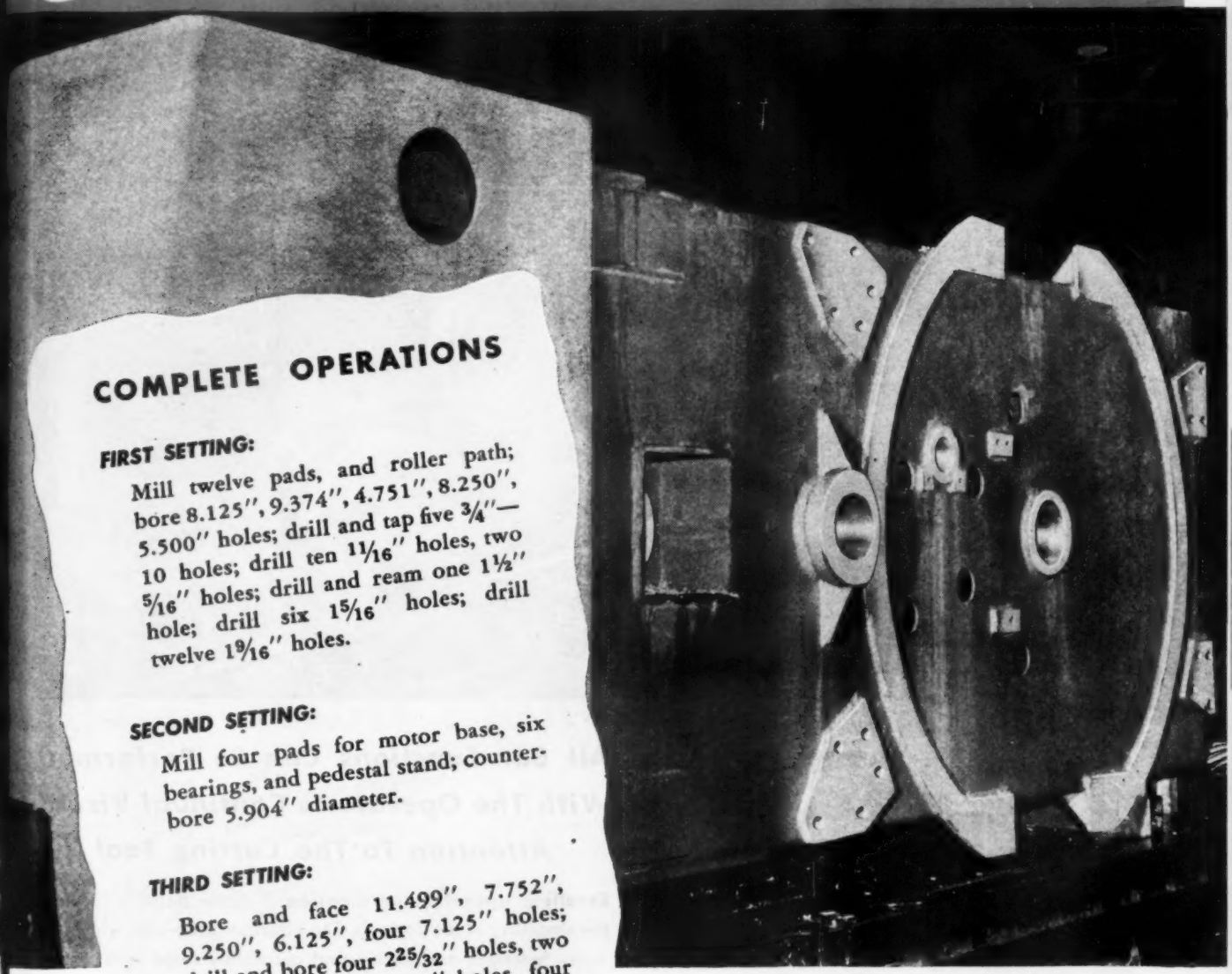




Right: G. & L. Floor Type Machine.

IN 3 SIMPLE SETTINGS OF THIS HUGE FRAME

G. & L. Scales and Verniers Permit Work Within the .002" Limits Required



COMPLETE OPERATIONS

FIRST SETTING:

Mill twelve pads, and roller path; bore 8.125", 9.374", 4.751", 8.250", 5.500" holes; drill and tap five 3/4"—10 holes; drill ten 11/16" holes, two 5/16" holes; drill and ream one 1½" hole; drill six 15/16" holes; drill twelve 19/16" holes.

SECOND SETTING:

Mill four pads for motor base, six bearings, and pedestal stand; counterbore 5.904" diameter.

THIRD SETTING:

Bore and face 11.499", 7.752", 9.250", 6.125", four 7.125" holes; drill and bore four 2 25/32" holes, two 2 1/32" holes, six 1.752" holes, four 2.002" holes; drill and ream 1.499" hole; drill, bore and ream two 2.450" holes, six 2.937" holes; drill and tap thirty 5/8"—11 holes; and drill nine 23/32" holes.

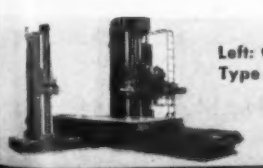
Revolving Top Frame for Excavator in first work position.

FREE Field Production Facts

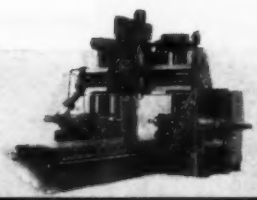
will help you solve difficult machining problems. Write today for your copy of Trade Journal Advertising AM138, covering advanced G. & L. machining methods. Please indicate your business connection.

MACHINE TOOL CO.

FOND DU LAC, WIS.

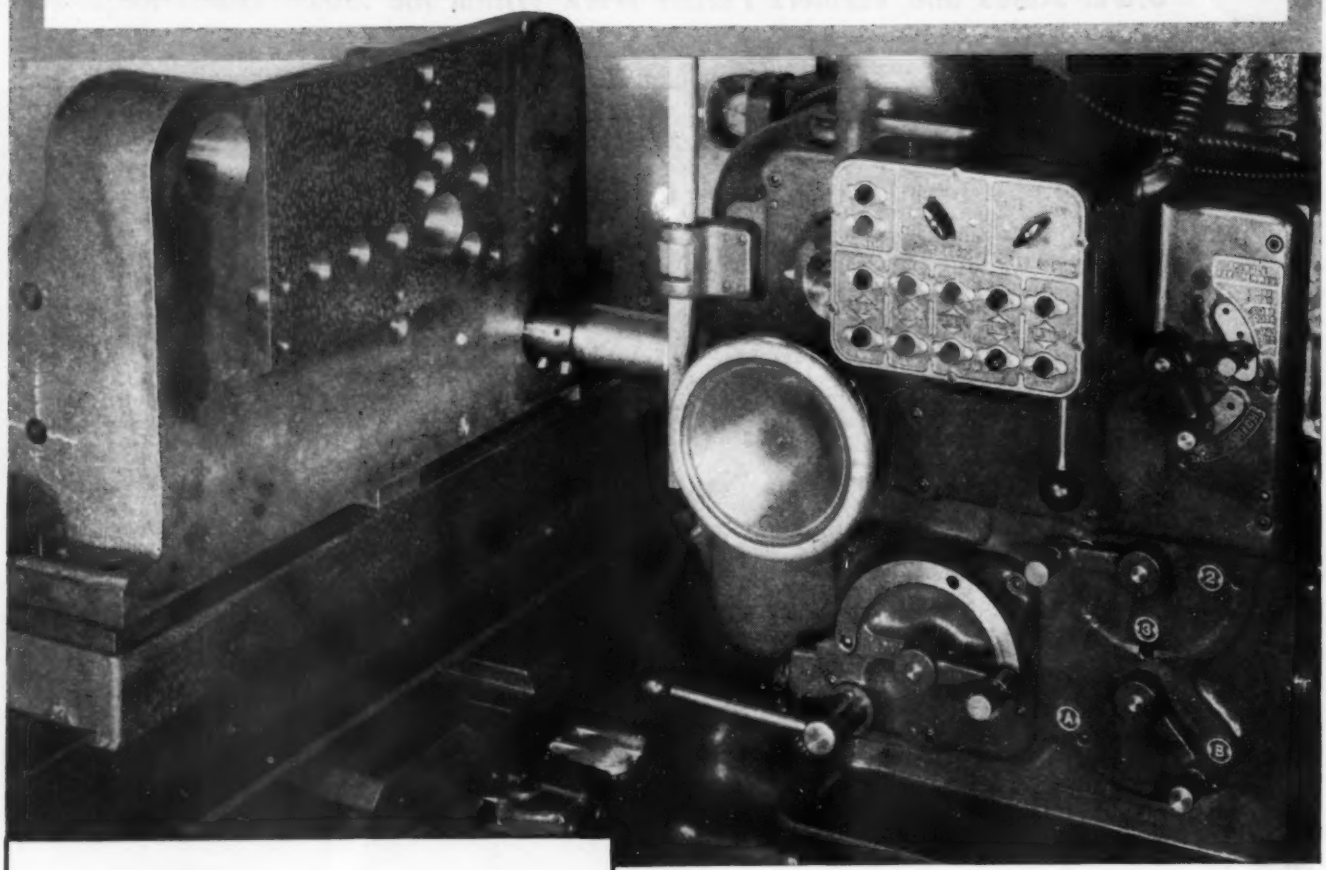


Left: G. & L. Planer Type Machine



Left: G. & L. Multiple Head Type Machine

You get Excellent Operator Coordination with the JIGMIL



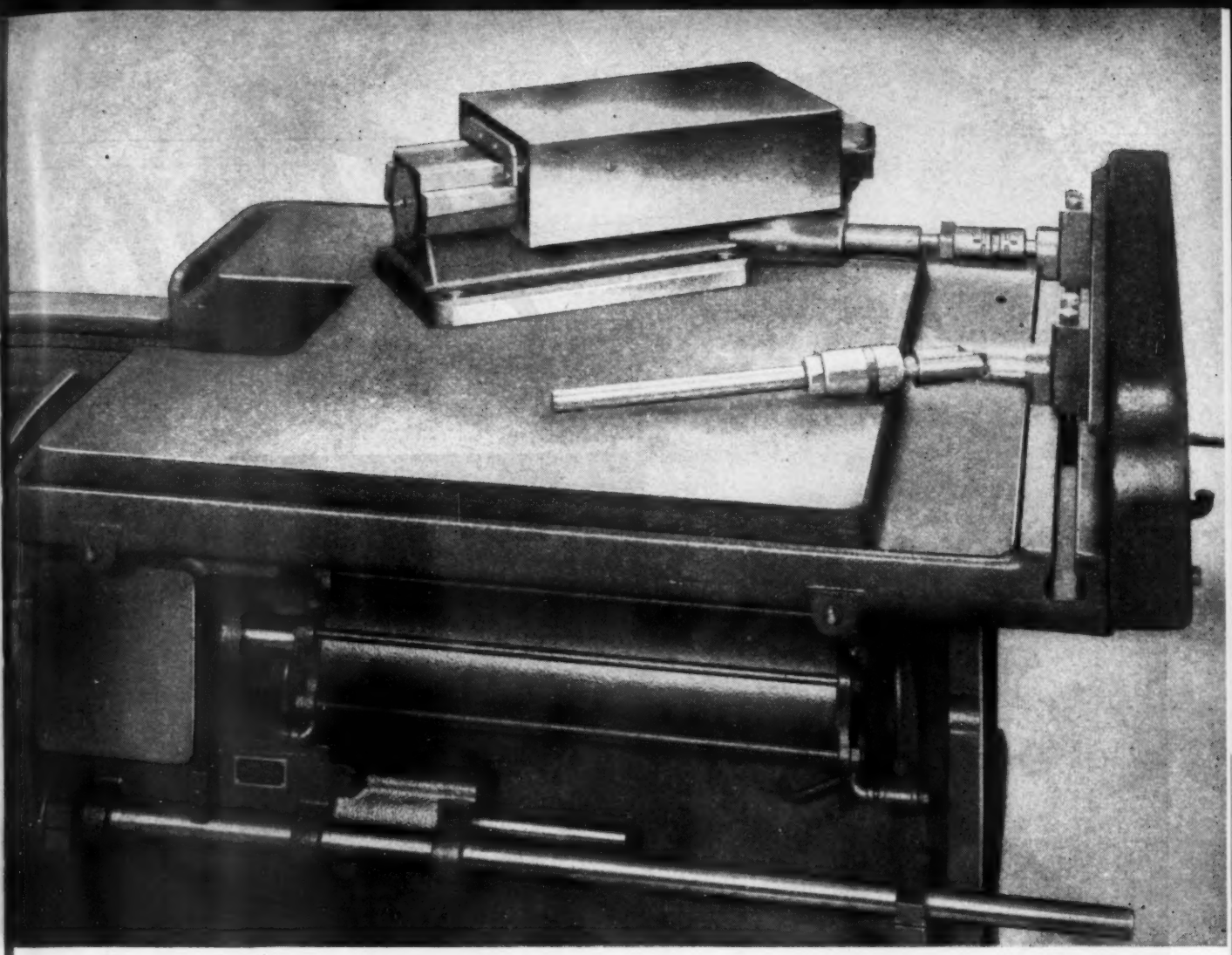
Write today for your descriptive bulletin

All Bar Functions Can Be Performed With The Operator's Continual Visual Attention To The Cutting Tool

Excellent operator coordination is made possible through the simplicity of the controls. The effortless ease with which the many functions are quickly and accurately responsive to any operator need is a dominant factor in the high productivity of the DeVlieg JIGMIL.

The bar movement has a screw actuated power feed and rapid traverse, responsive to a four-position lever, extending down from a master switch. A wheel is provided for hand operation and a micrometer dial for accurate depth control. *Users report two to three times the output and greatly increased accuracy.*

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**



THIS IS WHAT MAKES THE SIMPLIMATIC

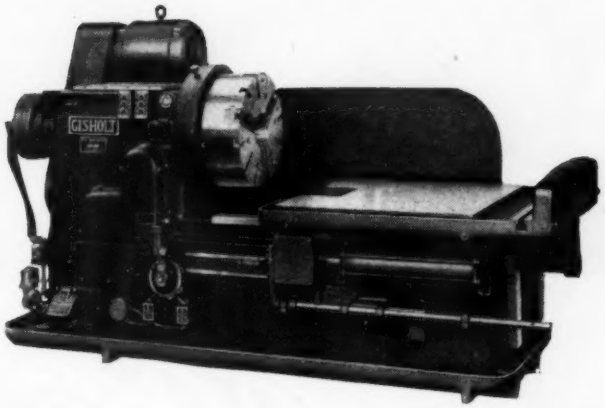
So Simple

Can you imagine anything less complex than this plain platen table? It provides a base for placing every tool in its most favorable working position. It permits the use of a greater number of slides with an unlimited choice of cutting angles.

Tool feeding mechanism is simple and direct. Each tool slide cam has its own drive shaft, independent of all others. All sprockets are chain driven from a single feed rod, geared to the spindle. Pick-off gears permit changes of feed for all tools without changing spindle speed.

Cam and roller design is simple and rugged to meet the demands of the heaviest cuts and stand up under high speed production year after year. Accuracy is assured by extremely heavy machine weight and rigidity combined with ways and gibs of hardened and ground steel.

With simple and effective tooling, the Simplimatic gives you the high productivity of a machine designed for the specific job. Write for information.



The Standard Simplimatic has swing of 33½" over the ways and 21⅞" over the table; 20" longitudinal travel of table and 15" maximum travel of tool slides.

GISHOLT MACHINE COMPANY

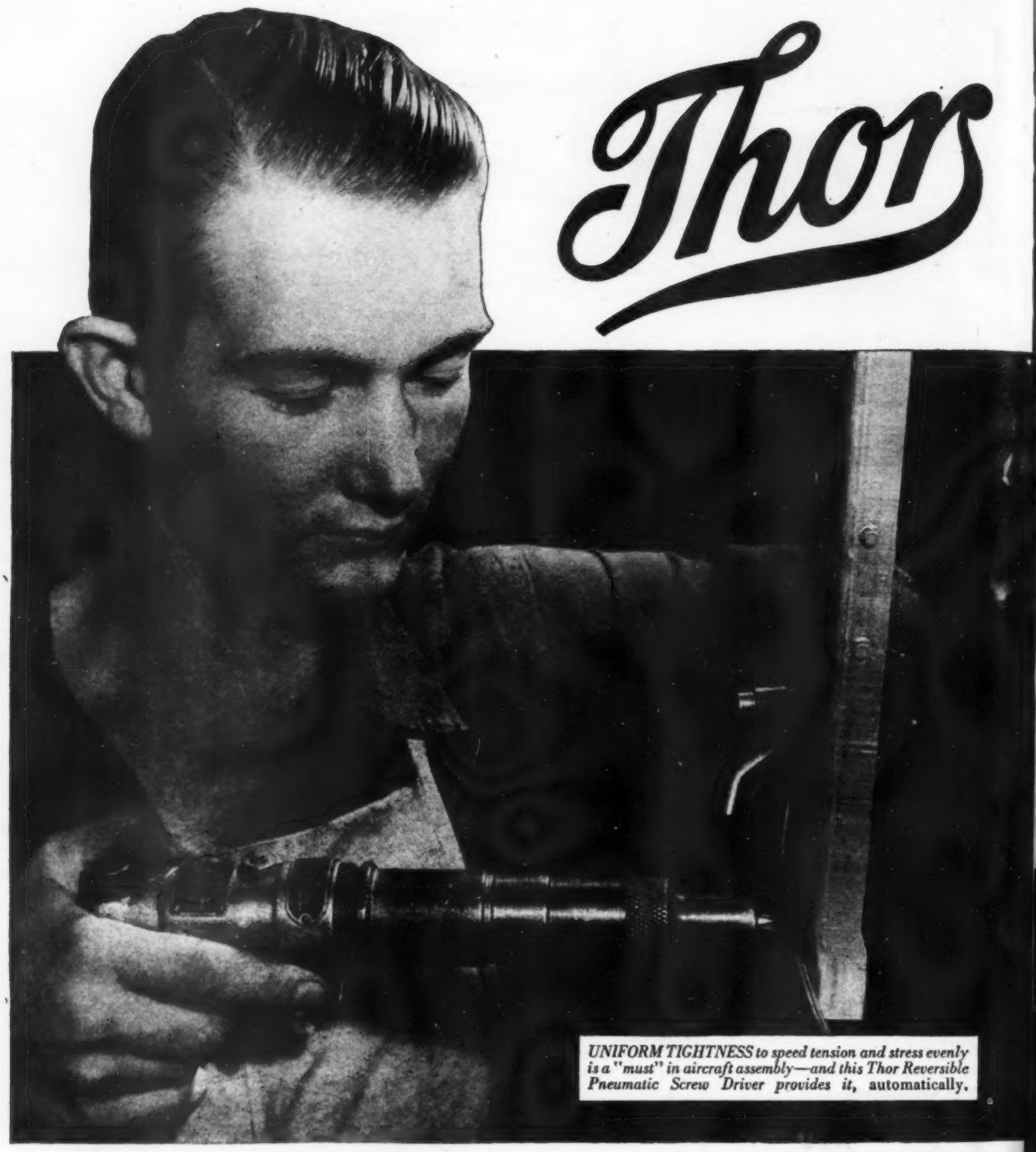
1201 East Washington Street • Madison 3, Wis.

GISHOLT

Look Ahead . . . Keep Ahead . . . With Gisholt Improvements in Metal Turning

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

Thor



UNIFORM TIGHTNESS to speed tension and stress evenly is a "must" in aircraft assembly—and this Thor Reversible Pneumatic Screw Driver provides it, automatically.

Thor PORTABLE POWER TOOLS

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS

HAS NEVER FAILED

to solve any screw driving or nut setting problem yet presented

In a half-century of making portable pneumatic and electric tools Thor has been called upon to solve assembly problems of every kind—from driving screws *fast* in shipping crates to setting nuts *precisely* in delicate instruments. • No problem has yet gone unsolved! • Whatever the size, type, location or tightness requirements of your screw driving or nut setting jobs, you can get precisely the right combination of speed, power and control—at lower cost, with Thor Power Screwdrivers and Nut Setters. Today, more of these Thor tools are in use than all other makes combined.

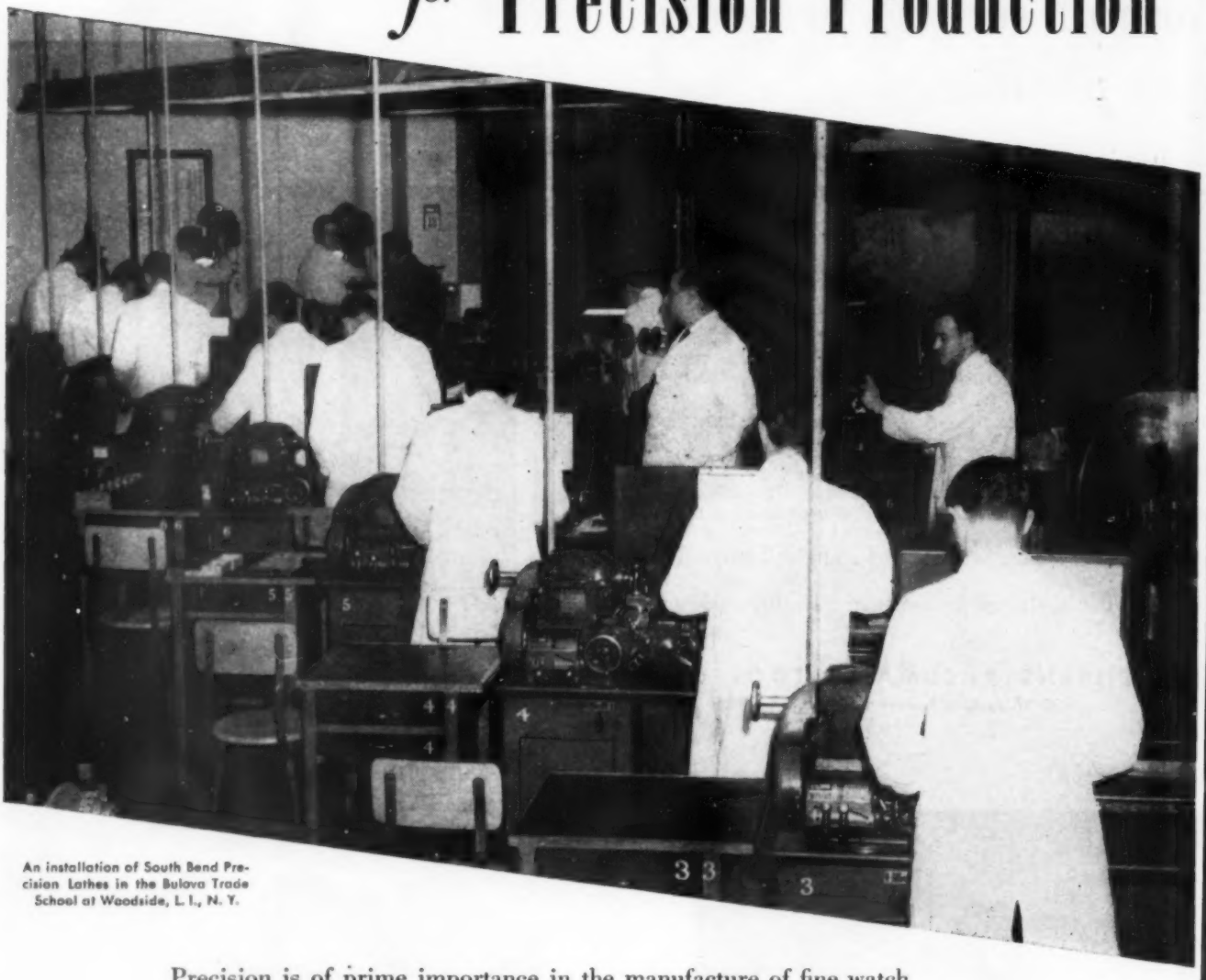
INDEPENDENT PNEUMATIC TOOL COMPANY
600 W. Jackson Boulevard, Chicago 6, Illinois
New York Los Angeles

S-P-E-E-D IS THE NEED in this small-unit assembly operation —the operator gets it with this easy-to-use Thor Electric tool.

HARD-TO-GET-AT JOBS become easy with the right Thor tool . . . as this pneumatic screw-driver with a Thor-engineered extension demonstrates.

POWER WITH HIGH TORQUE is called for to drive large wood screws under increasing load. This Thor high-frequency electric tool has it to spare.

South Bend Lathes *for* Precision Production



An installation of South Bend Precision Lathes in the Bulova Trade School at Woodside, L. I., N. Y.

Precision is of prime importance in the manufacture of fine watch parts. Skill and accuracy are required to operate the intricate machines which produce these parts. Specially trained supervisors and lead-men are needed to set up and maintain the machines. It is significant, therefore, that the Bulova Watch Company chose nine South Bend Model A 9-inch Underneath Motor Driven Lathes for use in its Trade School which supplies both the precision tools and the highly trained personnel which are essential to the making of world-famous Bulova watches.

Write for New Catalog, No. 100-D

Illustrates in full color and describes South Bend Engine Lathes and Toolroom Lathes with 9", 10", 13", 14½", and 16" swings. Also, Precision Turret Lathes with ½" and 1" collet capacities.

SOUTH BEND LATHE WORKS

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Van Keuren

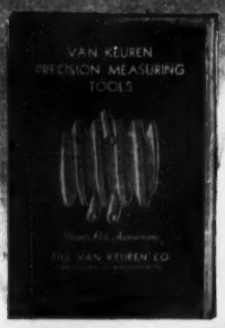
THREAD MEASURING WIRES

STANDARD EQUIPMENT EVERYWHERE

Van Keuren measuring wires are the accepted standard equipment for making measurements on thread gages, taps, worms, splines and spur gears. We carry a complete stock of sizes for measuring U. S. Standard, Whitworth, Metric, British Association, Pipe, Acme and 29° Worm threads. Special wires of any diameter in the range from .002" to 1.5708" are made to order. Our large supply of blanks insures prompt delivery.

Van Keuren thread measuring wires are manufactured to National Bureau of Standards specifications. They are hardened, ground and lapped by precision methods developed over a quarter-century. They are accurate within .00002" for roundness and straightness and within ±.000025" for size. Special sizes are made to any tolerance required.

It is easy to use Van Keuren wires. The Van Keuren handbook, — "Precision Measuring Tools" gives complete tables and simplified formulas for measuring all standard threads, splines and spur gears. Send for this valuable 160 page handbook No. 33.



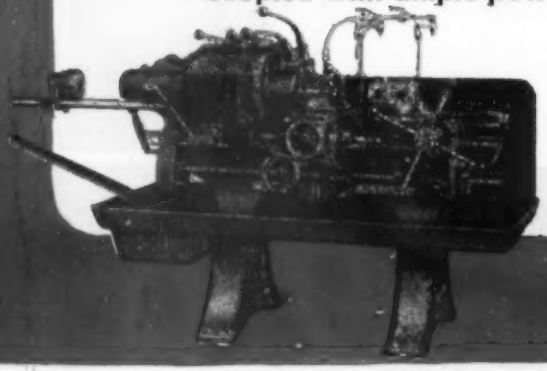
Van Keuren

25th YEAR

because it handles so easily.

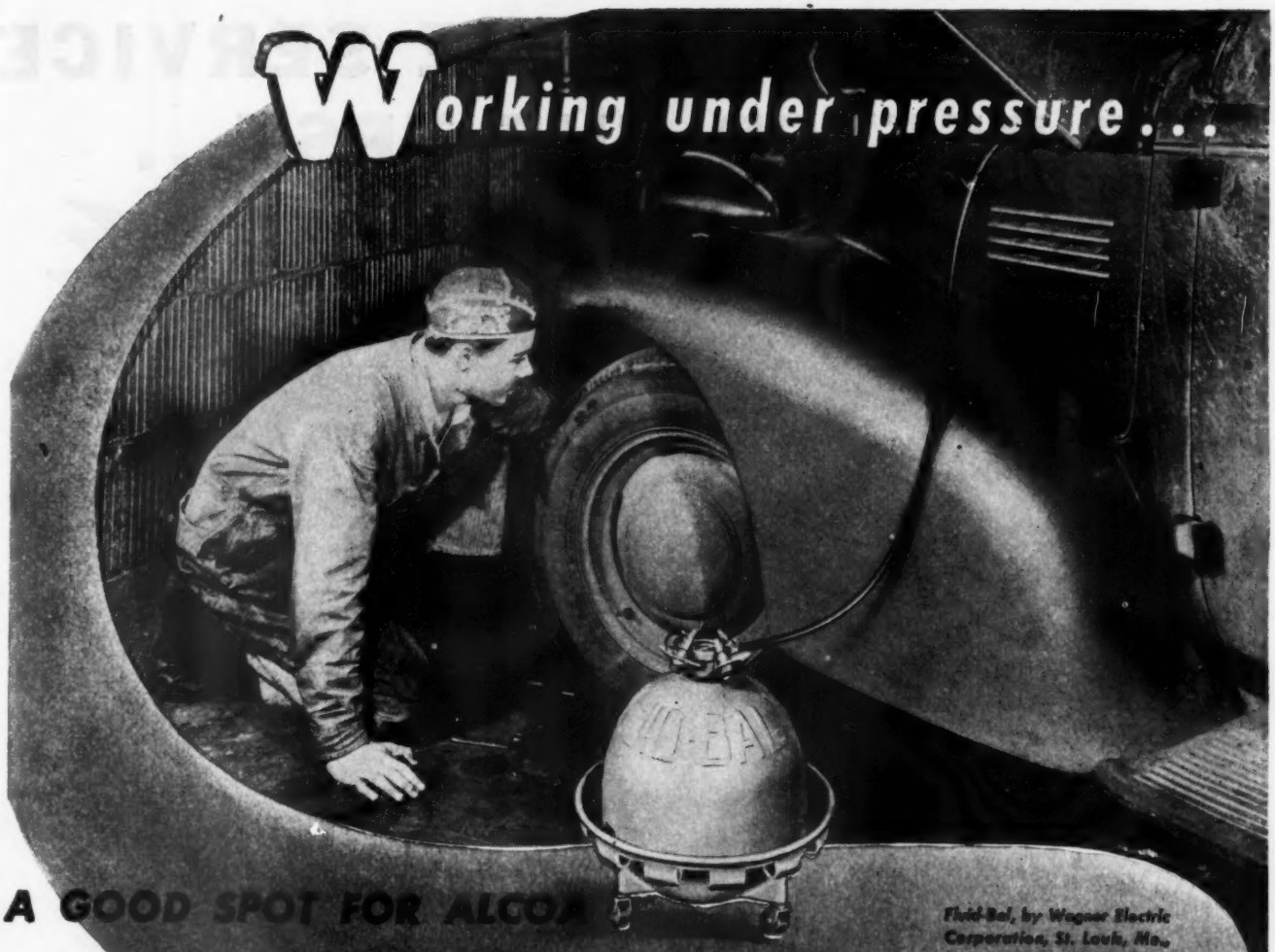
A new (effortless yet powerful) hydraulic spindle brake enhances still further its long standing reputation as the EASIEST OPERATED AND MOST SENSITIVE UNIVERSAL TURRET LATHE.

Coupled with ample power, speed, rigidity, and efficient tooling, the important feature of ease of handling makes this machine an outstanding producer of small parts from bars, forgings or castings.



BARDONS & OLIVER, Inc.
1133 WEST 9TH STREET CLEVELAND 13, OHIO

Working under pressure...



A GOOD SPOT FOR ALCOA ALUMINUM PERMANENT MOLD CASTINGS

Fluid-Bal, by Wagner Electric Corporation, St. Louis, Mo., for pressure bleeding automotive hydraulic brake systems.

Charged from an air line, this "Fluid-Bal" carries its own air pressure, simplifying the servicing of brake systems. With one job completed, it is easily moved on to the next, because it's made of lightweight Alcoa Aluminum.

Two aluminum hemispheres, made as permanent mold castings, are welded together to form this pressure-tight ball. The rack included in the lower casting holds the hose.

Pressure-tightness is only one advantage of Alcoa Aluminum permanent mold castings. They also give you excellent details and smooth surfaces, which require very little finishing. Dimensional tolerances can be quite close.

Manufacturing plants under pressure for large quantity production find Alcoa Aluminum permanent mold castings a great help, and most economical. For quotations, write ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA ALUMINUM

ALCOA ALUMINUM

THE TOUGHER THE SERVICE THE BETTER THE TEST...

Many small tools are capable of handling easy jobs with a certain degree of efficiency and economy, whereas on the tough job they might not stand the gaff.

Today, most jobs are tough, calling for tough tools. Then too, because of small tool shortage, all tools must sooner or later be assigned to gruelling service making it imperative that every small tool be capable of maximum performance in long, hard work.

The test of UNION TOOLS is to put them to work under today's conditions and let results dictate the tools you buy. On such a basis UNION will be the "Tools You Buy Again."

THE UNION LINE

Twist Drills—Milling Cutters—Reamers—Hobs—Slitting Saws — End Mills — Taps — Dies — Screw Plates—Profile Cutters.

UNION TWIST DRILL COMPANY, ATHOL, MASS.

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UNION

UNIT HEAD BOX TYPE WITH TWO VERTICAL AND TWO HORIZONTAL SPINDLES

NEWTON 84″ HEAVY DUTY PLANER TYPE MILLING MACHINE

Among Heavy Machine Tools built by Consolidated are . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER
SPECIAL MACHINES

FOR YOUR BIG MILLING JOBS

Originally designed for peacetime industry, this Consolidated machine found its proving grounds in war's emergency demands. Now with Victory, it again takes its place in competitive production. To those prewar features that earned this machine's reputation for dependability and performance, will be added new engineering skill and technique developed through wartime operation. You will find this Newton Planer Type Milling Machine well worth investigating for accurate, fast, and economical production of your heavy milling jobs.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1861

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

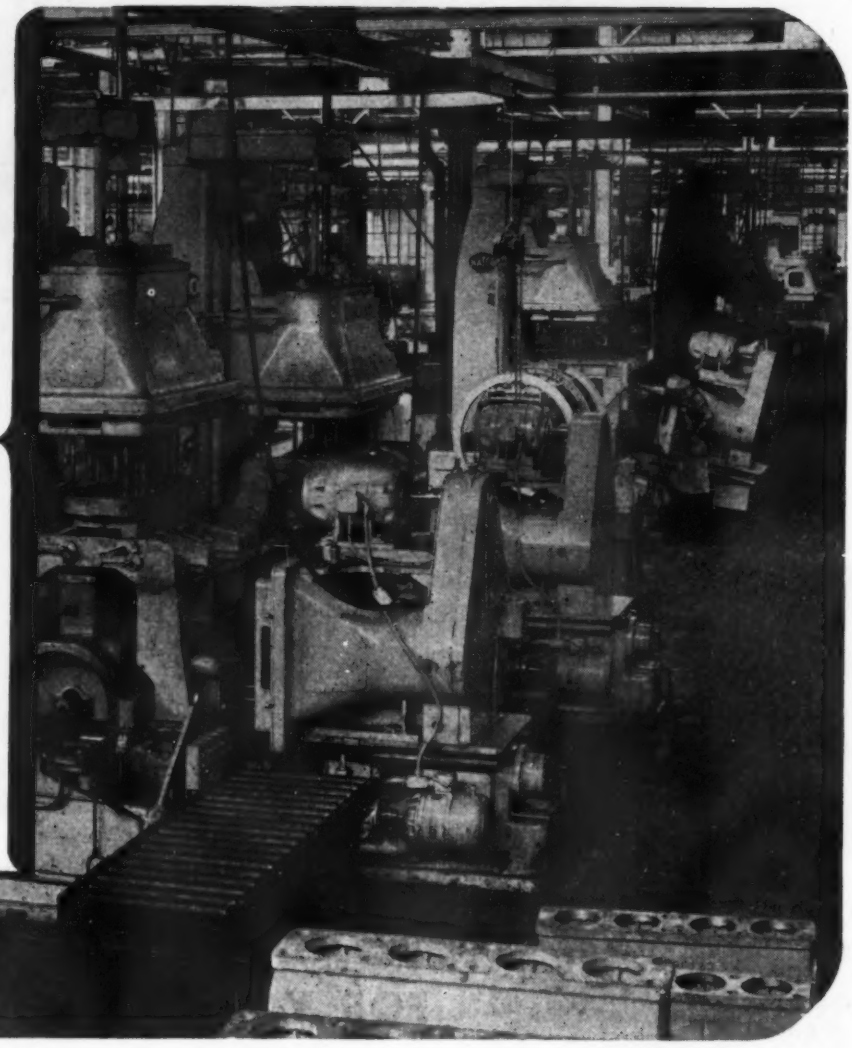
ROCHESTER 10, NEW YORK

SINCLAIR *has the Answers to Your Shop Problems . . .*

For Example:

SINCLAIR HONOL* is a specially developed coolant which gives exceptional accuracy and finish in the honing of cylindrical shafts, cylinders and other internal surface operations. It is suitable for all metals on which mirror finish is desirable. HONOL'S use permits highest speeds and at the same time increases life of stones.

**Honing fluid. U. S. Pat. Off. Reg. Applied for.*



OLDEST CRUDES MAKE FINEST LUBRICANTS

SINCLAIR provides a complete line of cutting and grinding fluids, both straight cutting oils and soluble oils. Have you a particular problem in maintaining production, or determining the correct cutting fluid for a specific operation? Sinclair consultants skilled in cutting operations and application of appropriate coolants are available to you.

SINCLAIR INDUSTRIAL OILS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.

ELECTRONIC DRIVE FROM A-C SOURCE

(Above)
Enclosure at rear of Norton 4-in. Type C grinder houses compact Thy-mo-trol electronic panel and other electric control.

(Left)
Ease and accuracy of control have made this grinder popular for production work on small parts.

PUTS 10 TO 1 SPEED RANGE AT HER FINGERTIPS

AN advanced type of precision grinder, built by the Norton Company, Worcester, Mass., has won wide favor for its high production rates on small machine parts. Its outstanding characteristic is simple, yet highly flexible, control, right at the operator's fingertips.

Work speeds on this grinder are set on a dial—any level from 100 to 1000 rpm, with constant torque throughout—thanks to the use of a G-E *Thy-mo-trol drive*. Jogging control is also easily adjustable over a wide range, and dynamic braking gives fast stops. Yet the machine operates on a regular a-c power supply.

FOR WIDE-RANGE STEPLESS SPEEDS

A Thy-mo-trol drive is a complete, co-ordinated set of equipment including an electronic panel, transformer, control station, and a d-c motor matched to the job. It's the increasingly popular choice of machine builders *and users* for applications requiring stepless speed control, adjustable accelerating torque, or constant speed under changing loads.

Standard Thy-mo-trol drives can be obtained in ratings from 1/8 to 25 hp. In special cases, speed ranges as high as 100 to 1 have been furnished. The experience of G-E engineers is available to help make Thy-mo-trol an integral part of your product or processing set-up. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

676-190-8930

THY-MO-TROL DRIVE

Buy all the BONDS you can—*and keep all you buy*

Snyder CAN DO YOU A GOOD TURN ON SPECIAL LATHES

Here are four center-driven lathes designed and built by Snyder to combine maximum production and accuracy with minimum handling in processing large heavy parts.

A. (No. 42595) A prewar machine for processing fabricated steel axle shaft housings for trucks. Center drive unit is small with short rear center movement actuated by air cylinders. Tail stock housing is rigidly mounted. Operations; turning various diameters near the wheel ends of the housing and facing numerous shoulders and flanges.

B. (No. 47826) Basically the same as Machine "A" but built to handle heavier, cast parts. Operations; turning with front tool blocks, facing and shouldering with rear tool blocks—which are reversible for rough or finish facing. Tail stop assembly slides in and out of work as an assembly.

C. (No. 43218) Essentially the same as Machines "A" and "B" but built to handle a cast armor plate rotor and designed with considerable travel of tail stock to provide loading space. Operations are turning and facing from both ends.

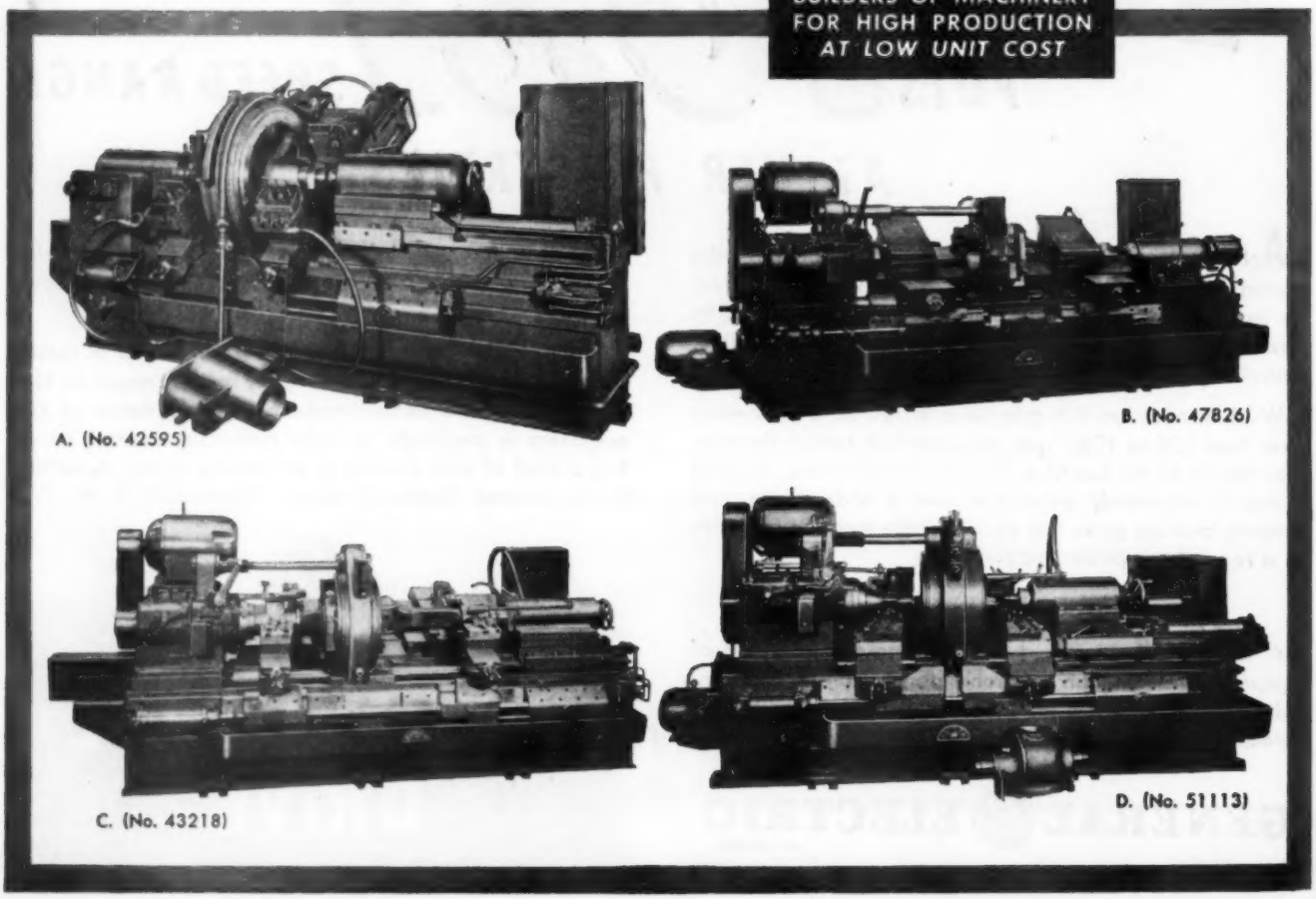
D. (No. 51113) For processing cast armor plate recoil housings. Rear tool slides have extremely long travel and conventional head stock and motor drive to center drive have been eliminated. Center drive is direct from motor and transmission in rear of machine. Operations; turning with front tool blocks and facing and shouldering with rear tool blocks.

All of these lathes are hydraulically operated and electrically controlled and operate on an automatic work cycle. The scope of operations and variety of parts indicate the versatility and flexibility of this type of Snyder special-purpose machine.

If you are interested in accurate cost-control in any metal-cutting operation, we invite your inquiries. *Snyder Tool & Engineering Company, 3400 E. Lafayette Avenue, Detroit 7, Michigan.*

20 Years of Successful Cooperation with Leading American Industries

SNYDER
DESIGNERS AND BUILDERS OF MACHINERY FOR HIGH PRODUCTION AT LOW UNIT COST



A. (No. 42595)

B. (No. 47826)

C. (No. 43218)

D. (No. 51113)

LOWER COSTS for BETTER PRODUCTS

with Acme-Gridley CHUCKERS

Let's look ahead six months or a year, or two years—to the time when war production is finished.

Nation-wide plant capacity will be greater than ever before. We can make more goods than reasonable demand can absorb.

With material and labor costs about the same in all plants, isn't it logical to look upon *time of production* as the one controllable factor in setting up competitive prices?

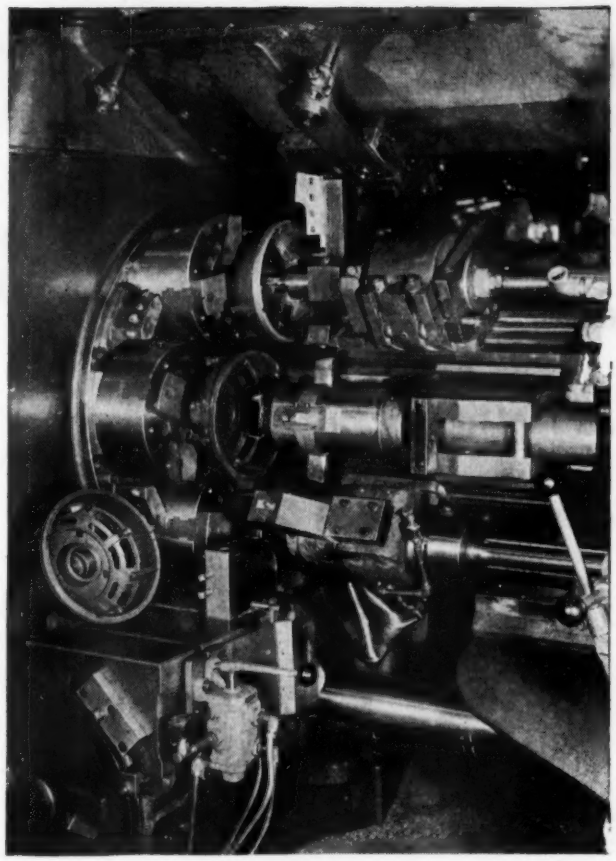
Here is a typical example:

The part is a cast iron motor bracket, $10\frac{1}{2}''$ in diameter. There are many ways to do the 14 operations necessary to finish this part.

On a 12" Six-Spindle Acme-Gridley Chucking Automatic, using carbide-tipped tools, machine time for all 14 operations was cut to *less than a minute.*

That's the way Acme-Gridley Chuckers can help you achieve lower competitive selling prices—by producing your precision parts in less time.

Acme-Gridley Chuckers are universal machines—not special one-purpose tools.



Booklet "How Costs Were Cut on 25 Chucking Jobs" shows their broad-range adaptability. Send for your copy.

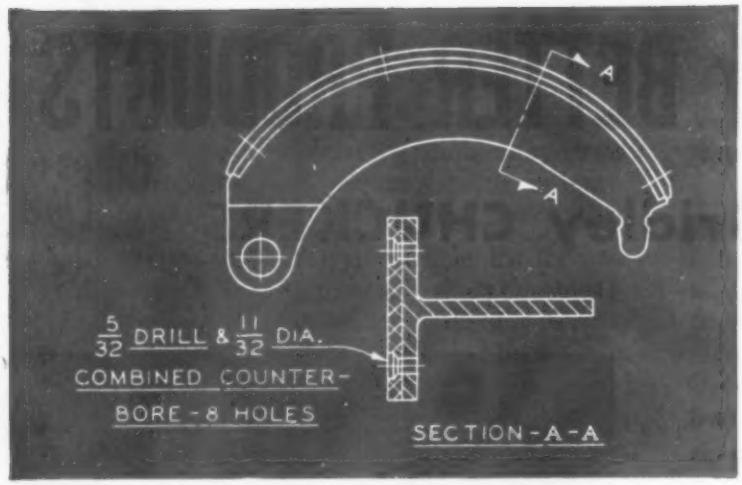
The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

COLLETS AND PUSHERS

The design, materials and methods of processing GENUINE Acme-Gridley Collets and Pushers are vital to continuous low-cost performance on your Multiple Spindle Automatics.

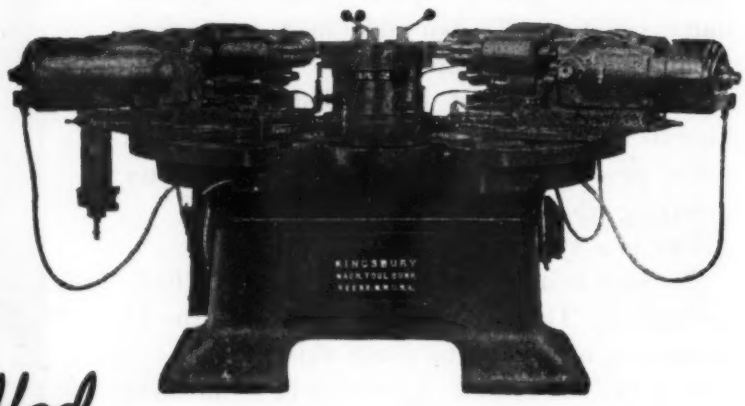
Bulletin CP-45



THIS IS A FLEXIMATIC

AUTOMOTIVE JOB!

Brake Shoe and Lining Production Speedily and Accurately Handled



FLEXIMATIC

by KINGSBURY

One important advantage of the FLEXIMATIC is the fact that it is a machine providing automatic indexing for performing various machining operations in a single chucking of the work.

This method is specifically applied to the Model GD Eight-Spindle Fleximatic arranged for drilling and counterboring brake shoes and linings shown in the accompanying drawing. Many variations of the machine are available, some for lining only and others for shoes only.

The FLEXIMATIC system pioneered by Kingsbury, involves a single base on which is mounted an indexing turret and standard metal cutting units for each operation such as drilling, reaming, counterboring, etc. The turret is designed to receive a number of duplicate work holding fixtures and can be rotated intermittently under control of the operator for presenting fixtures to loading and working stations. While units are in action, the turret is locked securely. All automatic operations are performed simultaneously while the operator removes a finished part and replaces it with a rough part at the loading station.

Speed, accuracy and easy handling even by unskilled operators are inherent in the performance of FLEXIMATICS.

Write today for illustrated Bulletin showing a number of different set-ups

KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U.S.A.

ALCOA'S NEW

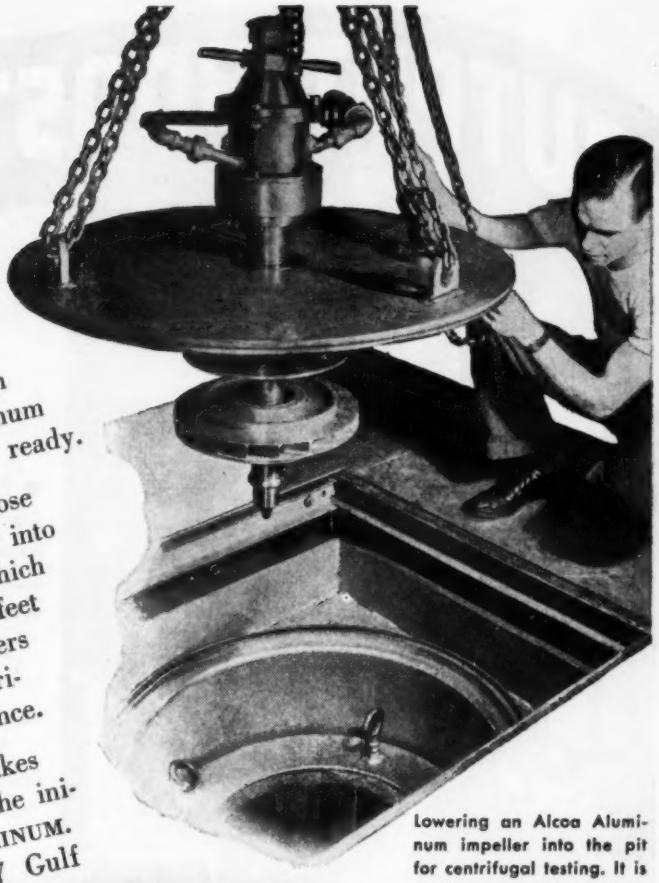
"Whirl pit"

CAN RUN FASTER THAN SOUND

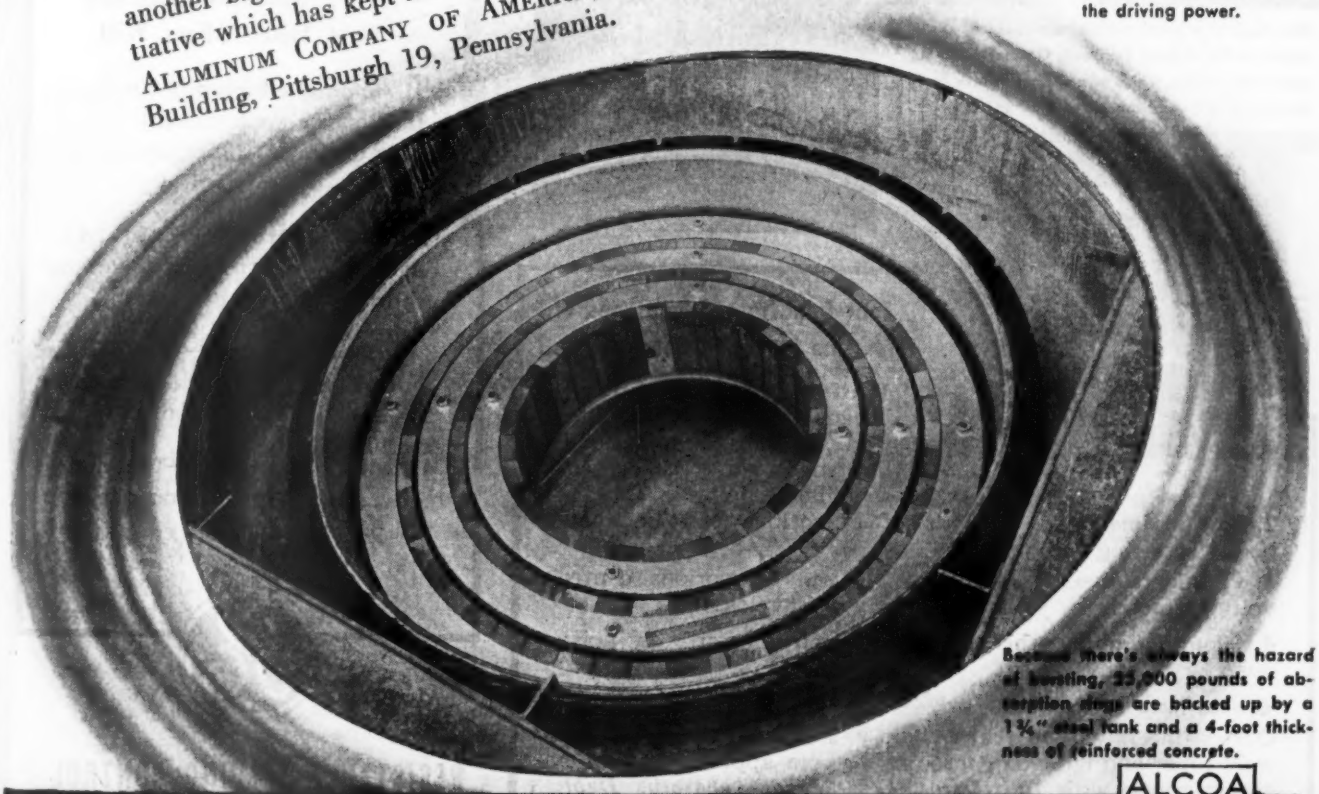
Are rotating parts of engines to run at higher speeds? Will gas turbines place new demands on metals? Let an engine builder ask for aluminum pieces to handle those assignments and Alcoa is ready.

Alcoa foundries and forge plants will produce those parts according to their designers' wishes. Then into the whirl pit they go, to be rotated at speeds which may go as high as 60,000 r.p.m. (Pieces five feet in diameter can be tested.) Stress-coat lacquers measure centrifugal stresses, permitting redistribution of the metal to improve performance.

With this new whirl pit, Alcoa KNOW-HOW takes another big step forward, again displaying the initiative which has kept ALCOA First in ALUMINUM. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.



Lowering an Alcoa Aluminum impeller into the pit for centrifugal testing. It is run in a vacuum to reduce the driving power.



Because there's always the hazard of bursting, 25,000 pounds of absorption rings are backed up by a 1¾" steel tank and a 4-foot thickness of reinforced concrete.

ALCOA FIRST IN ALUMINUM

OUTPUT BOOSTED 33%

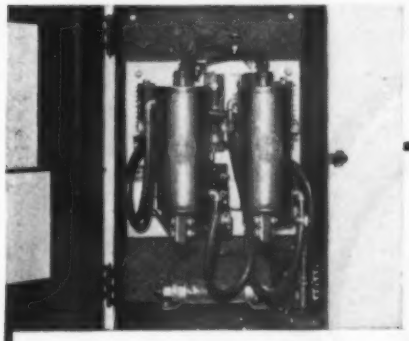
by installation of modern projection welders with ELECTRONIC CONTROL

Five shock absorber assemblies are produced every minute at the Gabriel Company, Cleveland, by this projection welder, which is equipped with a combination of G-E weld timer and ignitron contactor.

● Production of automobile shock absorbers by the Gabriel Company (Cleveland) has increased from 225 to 300 assemblies an hour. The new welders, which replace manually operated machines, are equipped with a G-E electronic weld timer and ignitron contactor.

With this new equipment, weld timing is much more accurate, according to I. J. Samuelson, plant manager. And there is far less variation in welds than before.

Also, wear and tear on dies has decreased, because less welding pressure is required. This reduction is made possible by improved pressure control.



Four Important Advantages of the Ignitron Contactor

1. High-speed operation—because there are no moving parts, its speed of operation is limited only by the control-switch setting.

2. Low maintenance—millions of operations can be made before servicing is required.

3. Plug-in relay—contactor can be used on various control voltages merely by plugging in the correct relay.

4. Silent operation—this *electronic* switch is completely noiseless.

● Need More Information?

Our engineers will be glad to help you select exactly the right weld timer and ignitron contactor for your application. Simply get in touch with the nearest G-E office. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

Here's What the Electronic Weld Timer Offers YOU

1. Automatic timing of the duration of the weld current—operator errors in timing are eliminated.

2. Safe operation—a sturdy, deadfront construction gives operators maximum protection.

3. Easy inspection—because the control panel is hinged, it is easily accessible for inspection.

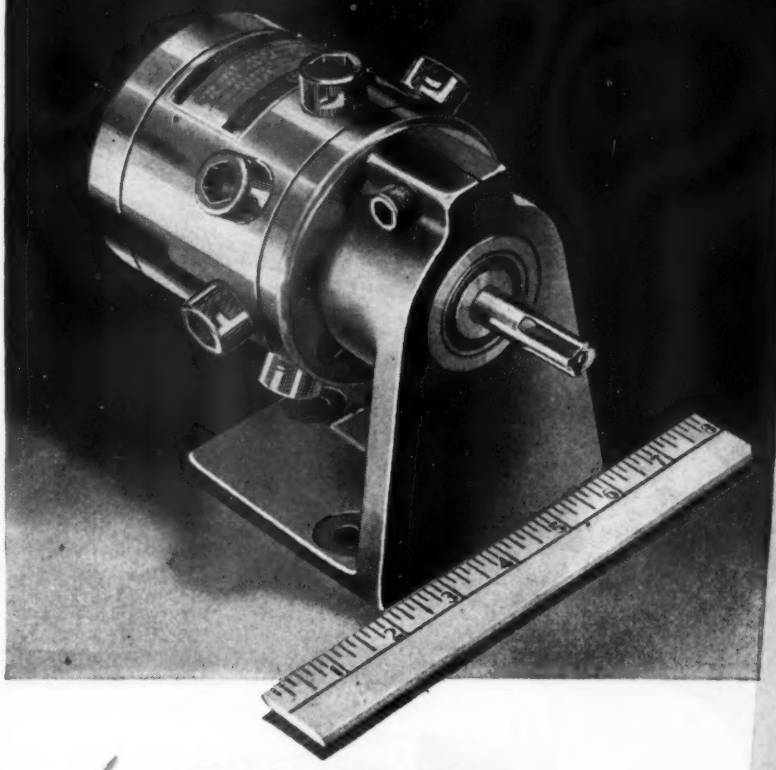
4. Quick adjustment—the dial is conveniently located on the control panel.

RESISTANCE-WELDING CONTROL

Keep on buying BONDS—and *keep all you buy*

GENERAL ELECTRIC

SECO FLUID POWER PUMPS WILL IMPROVE YOUR HYDRAULIC SYSTEM



Revolutionary Design

enables these small, fixed displacement hydraulic pumps to generate pressures up to

10,000 P.S.I.

The pressure is generated within

Hollow Pistons

The higher the pressure the tighter the seal between the moving piston, cylinder sleeve, and pump body. Due to this inherent sealing quality of the *Hollow Pistons*, the higher the pressure the greater the overall mechanical efficiency.

- ✓ **LOWER MAINTENANCE**
- ✓ **LONGER LIFE**
- ✓ **HIGHER PRESSURE**
- ✓ **SMALLER UNITS • SMALLER LINES • SMALLER RESERVOIR**

SECO radial hydraulic pumps are built to generate, and stand up under, extremely high pressures — higher, possibly, than you now use. But the fact that they operate efficiently at higher pressures means that at lower pressures they simply loaf — as far as stress and wear are concerned. And by utilizing higher pressures you can use smaller, more compact actuating cylinders, smaller lines, a smaller oil reservoir — all making for cleaner, more compact design.

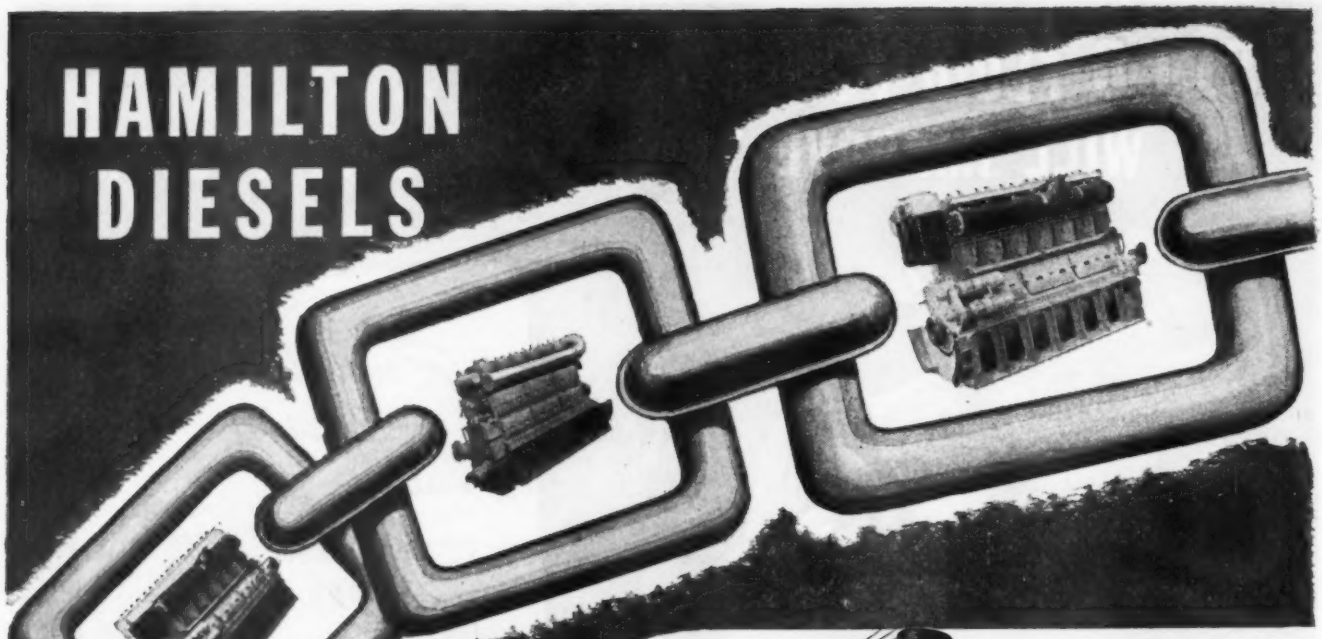
MODELS: Seco pumps are at present being built in four models. No. 20 LAH (illustrated) which delivers ½ G.P.M. at 10,000 P.S.I. Identical in size and appearance but of slightly greater displacement is 20 LAL which delivers 1¼ G.P.M. at 3,000 P.S.I. Model 80 LAH is a larger pump delivering 1¾ G.P.M. at 10,000 P.S.I., and Model 80 LAL with greater displacement, delivers 5 G.P.M. at 3,000 P.S.I. All models reach rated capacity at 1750 R.P.M.

INQUIRIES ARE INVITED from manufacturers who use fluid power pumps in quantity. Single pumps for replacement are also available in all four models. Write for Bulletin LA.

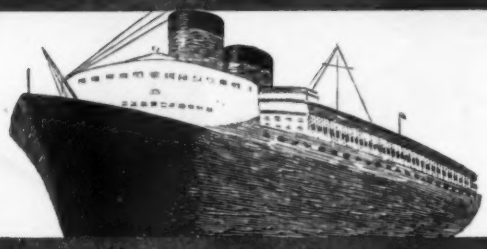
SIMPLEX ENGINEERING COMPANY
MANUFACTURERS OF THE **SECO** HYDRAULIC CLOSER NOW ALMOST UNIVERSALLY USED ON FILTER PRESSES OF ALL MAKES

NEWARK ROAD,
ZANESVILLE 18, OHIO

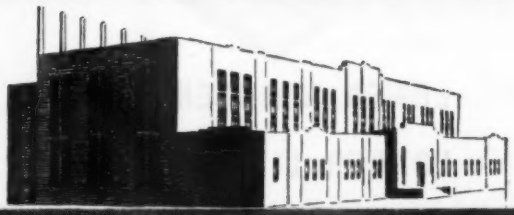
HAMILTON DIESELS



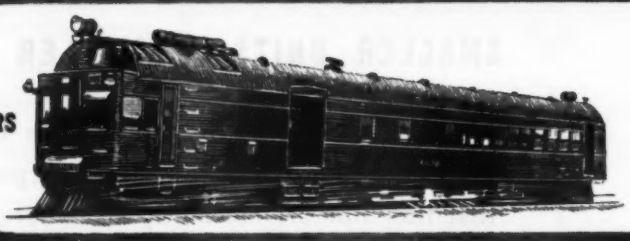
MARINE



CENTRAL STATIONS



RAILCARS



FACTORIES

A CHAIN OF POWER THROUGHOUT THE WORLD

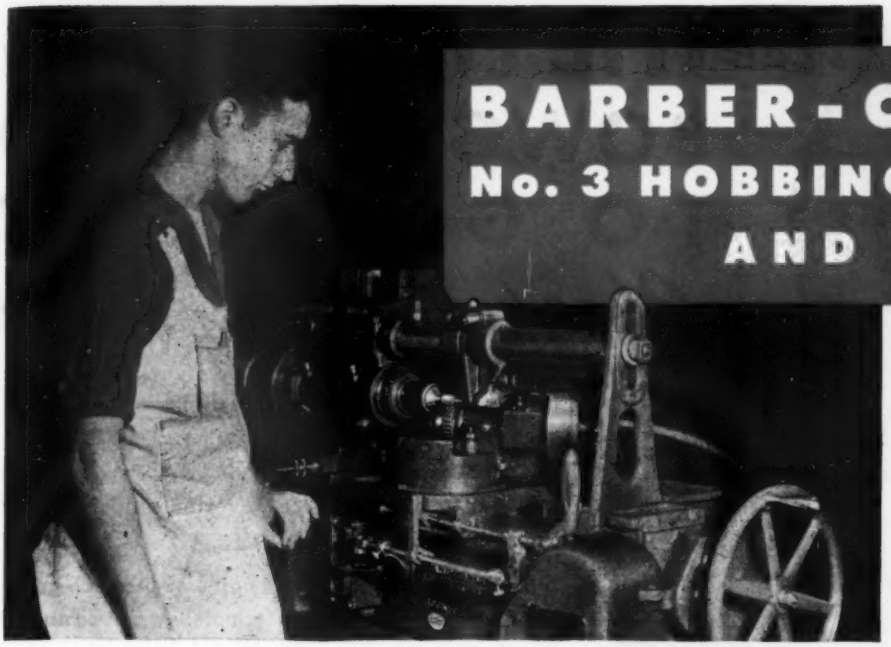
From 400 to 10,000 H.P.

GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

REPRESENTED THROUGHOUT LATIN AMERICA BY MACHINE AFFILIATES, INC.

THE NILES TOOL WORKS CO. • THE HOOVEN, OWENS, RENTSCHLER CO. • GENERAL MACHINERY ORDNANCE CORPORATION

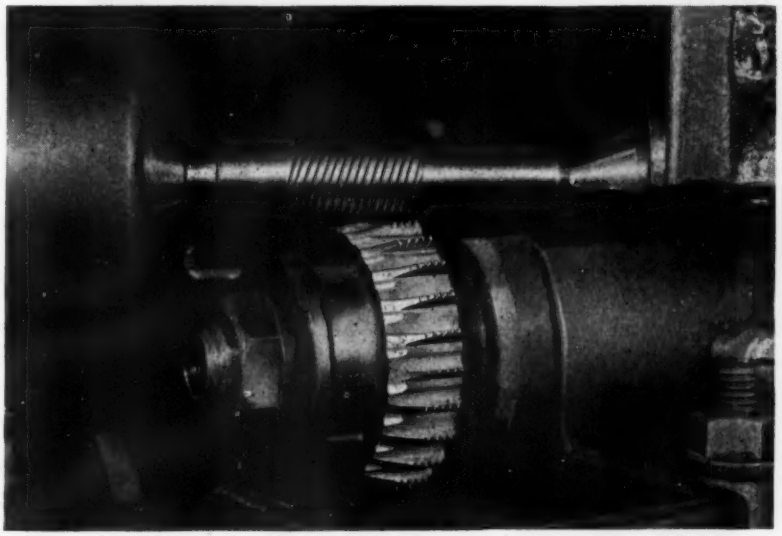


BARBER-COLMAN
No. 3 HOBBING MACHINE AND B-C HOBS

Barber-Colman No. 3 Hobbing Machine used to generate the six-thread worm shown in close-up below.

SHOW HIGH ACCURACY AND LONG LIFE ON A 6-THREAD STEEL WORM JOB

If you should be faced with a problem of how to cut multiple thread worms with fine finish and close tolerances, consider the *Hobbing Method.* Jobs similar to this one may be set up as a helical gear and the teeth generated with better accuracy, efficiency and longer tool life. The Barber-Colman No. 3 Hobbing Machine lends itself readily to work of this type because of its flexibility, ease of set-up, inherent accuracy and high production capacity. B-C Engineers, with wide experience in hobbing applications, will be glad to offer assistance in figuring set-ups and designing suitable hobs. *Consult Barber-Colman Engineers on your gear cutting problems.*



HOB DELIVERS 3500 PIECES

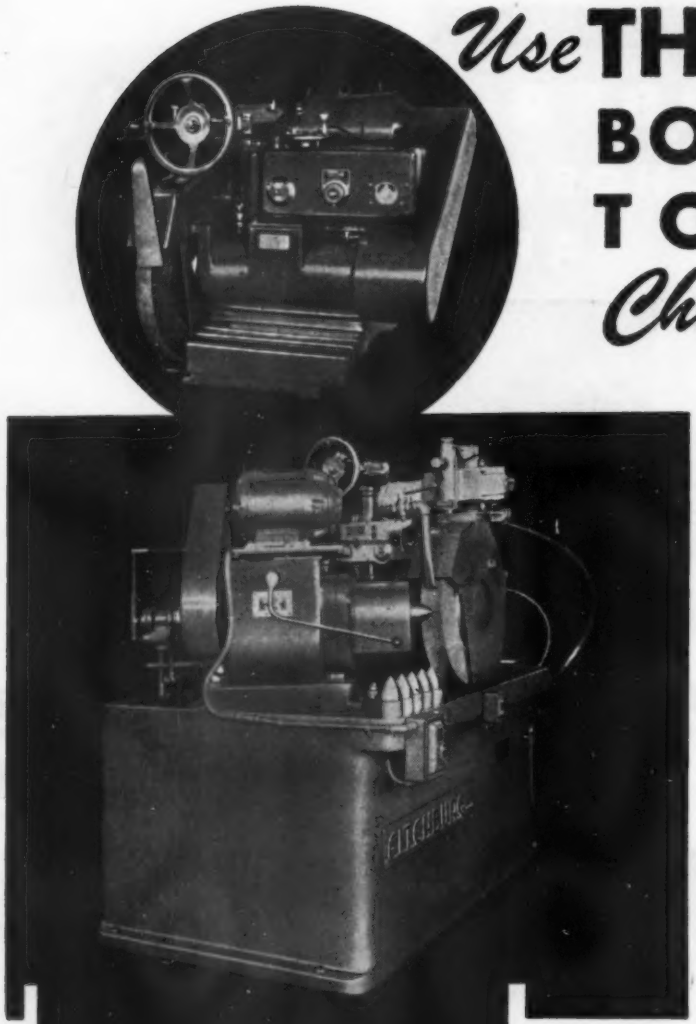
Tool life on this job is 3500 pieces, the unground hob shown above being nearly ready for replacement. Material is stainless steel, 20-22 Rockwell "C", and the worm has six threads, 72° 50′ helix angle and .075" circular pitch. The outside diameter is .4983", and length of threaded portion is 1-3/16". With a set-up for .010" feed per revolution of work and a hob speed of 309 r.p.m., 20 pieces per hour are produced. Tolerance is +.000/−.002" on pitch diameter, checked with a GO/NO-GO gage.

BARBER-COLMAN COMPANY

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U.S.A.

Use THE FITCHBURG BOWGAGE HEAD TO GRIND IT *Cheaper, faster, better*



Just as multiple tooling and combined cuts increased production profits of machined work in mass production, the Fitchburg method of precision grinding cuts additional cost factors from every piece, saves on production and equipment.

Designed on an entirely new principle of precision grinding, the Fitchburg head is a completely self-contained and independent grinding unit. It may be installed singly or in multiples to operate simultaneously or consecutively in mass production. It also may be installed to modernize any equipment.

Get the facts — you will instantly make a favorable comparison between Fitchburg Automatic Precision grinding and any other method. Install a Fitchburg now, and use your "Head" to cut costs and speed production. Send your blueprints for our engineers' recommendations — there's no obligation.

THE HEAD. *The Bowgage Head* is a completely independent precision grinding unit. It has rapid traverse, slow grinding feed, grinding dwell or spark out, and rapid return to starting position — all started by one push button. It is precise to .0002", minimizing spoilage. It can be removed and remounted for other work, if operations are changed.

THE BODY. *This Fitchburg Single-Head Ojive Grinder*, designed to grind the ojive of the 75 MM armor piercing shell, is typical of Fitchburg cut-cost production. The wheelhead, carrying a 24" x 3½" face wheel, is completely automatic. It is mounted with a hydraulic form trueing device to true the face of the grinding wheel at the proper radius for the nose of the shell. The workhead is equipped with a parallel-motion jaw-chuck, operated by a hydraulic cylinder at the back of the workhead.

Write Today for Catalog—Sent Free Upon Request

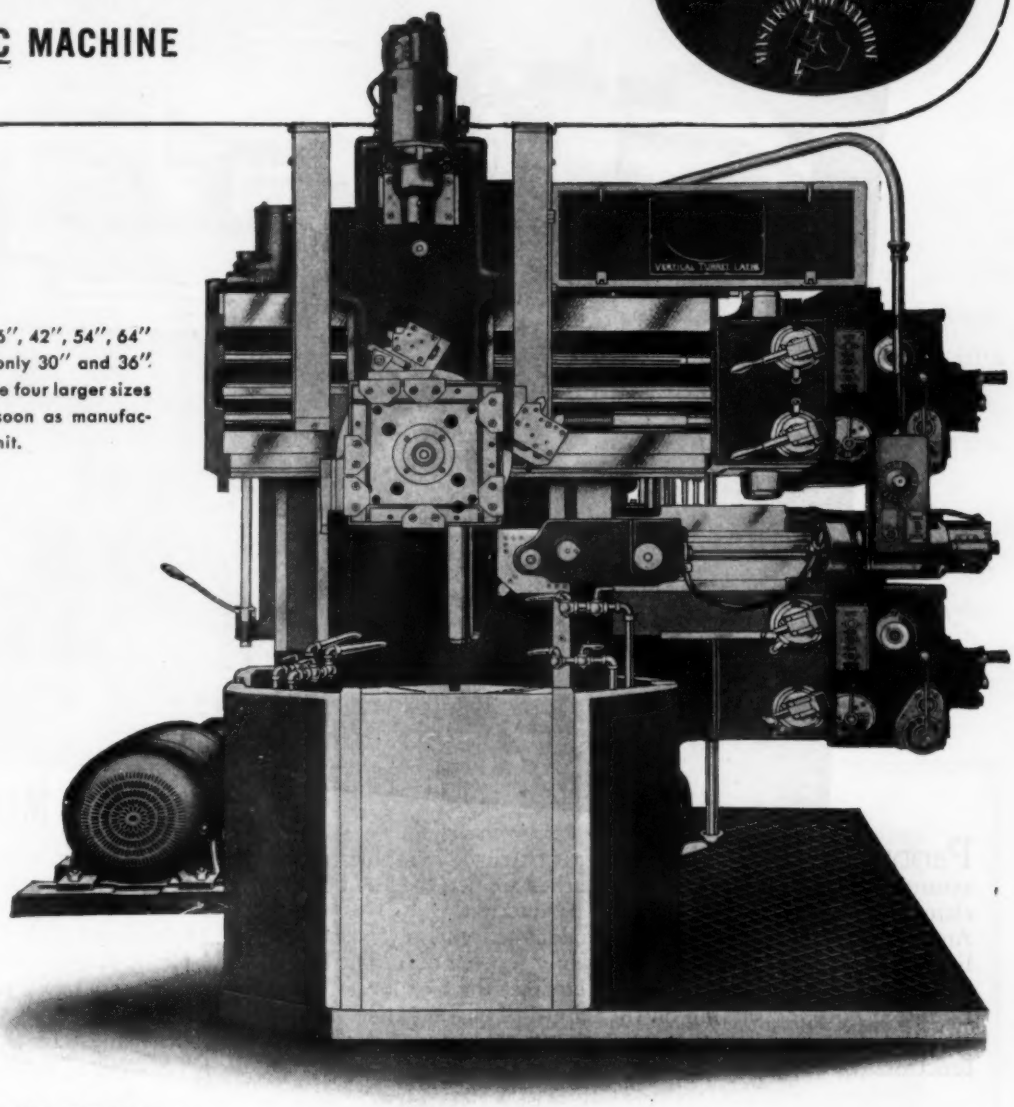
FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of— Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Both Full Universal Grinders and Special Purpose Grinders.

ONLY A BULLARD MAN-AU-TROL V.T.L. ALLOWS MANUAL OPERATION OF AN AUTOMATIC MACHINE

BULLARD
MAN-AU-TROL
MASTER OF THE MACHINE



Machine sizes: 30", 36", 42", 54", 64" and 74". At present only 30" and 36" sizes are available. The four larger sizes will be available as soon as manufacturing conditions permit.

. . . *because* MAN-AU-TROL *is*

the automatic control that is as versatile as manual control

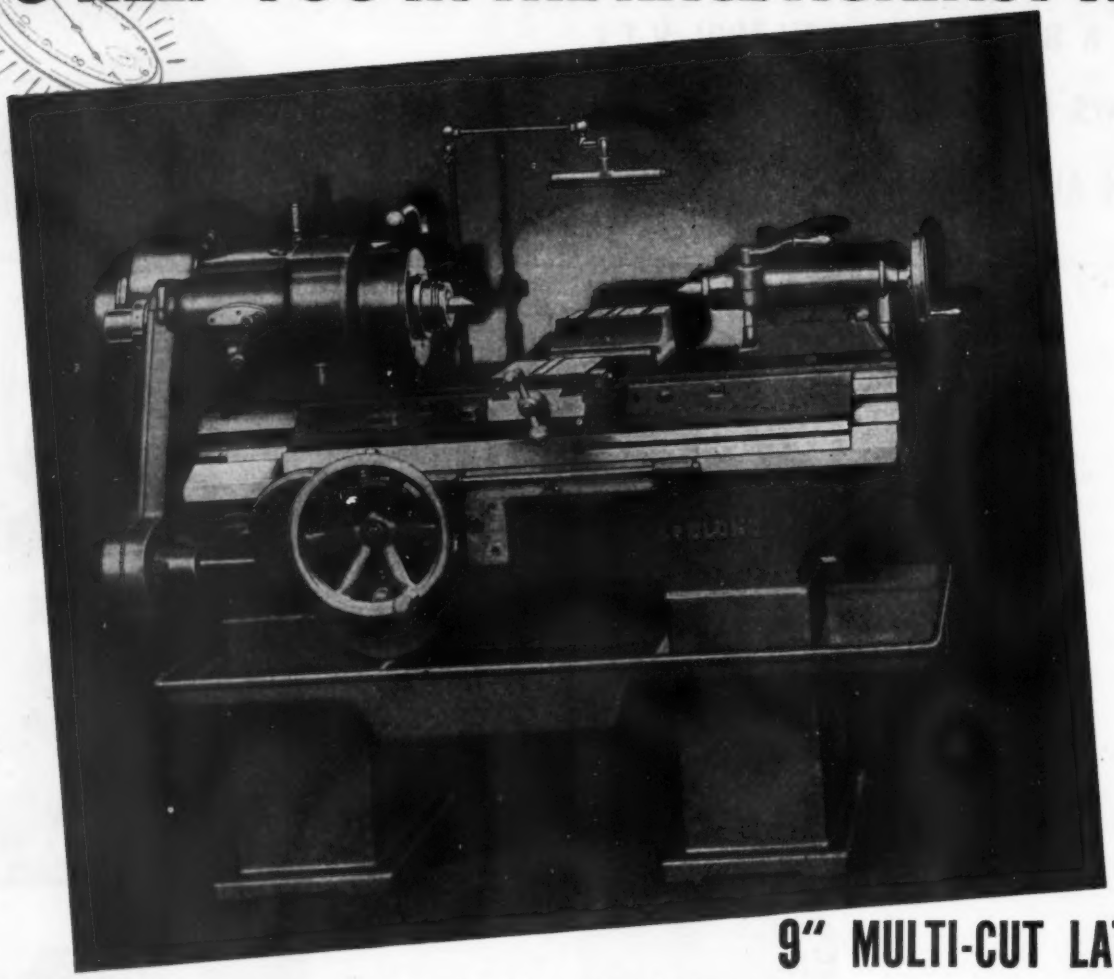
When you decide to buy a Bullard MAN-AU-TROL V.T.L., your chief reason will be that you want all the benefits of an automatic lathe *plus* all the versatility of a manually-operated machine.

To these benefits, add another. Suppose you have your MAN-AU-TROL V.T.L. all set up for automatic production of a piece with Bullard standard-type tooling. Along comes a rush job for one piece of an entirely different kind. The chances are that you will find it profitable to change the tool set up for manual operation on this one piece . . . without, of course, disturbing the automatic cycle. When that one-piece job is finished, you quickly reset your tooling by means of gauges, and before you know it, the machine is back on the production run with the automatic cycle.

Other benefits you will get from the Bullard MAN-AU-TROL V.T.L. are fully described in Bulletin MAV-G-1. Write today. The Bullard Company, Bridgeport 2, Conn.

BULLARD CREATES *NEW METHODS* TO MAKE MACHINES DO MORE

TO HELP YOU IN THE RACE AGAINST TIME



9" MULTI-CUT LATHE

PRODUCTION is always a race against time. Machines and tools that save time, cut costs. And reduced costs assure better profits. All LeBlond Lathes are designed and built to provide you with this time-saving, cost-cutting element so necessary to profitable production.

An excellent example of built-in production economy is the LeBlond Multi-Cut Lathe. It provides practically unlimited tooling possibilities, but at low tooling cost. The set-up is simple. And from then on the operator simply loads and unloads the machine and engages the feed levers. One operator can handle two or more of the Multi-Cut Lathes at once, depending on the length of cutting time. The LeBlond Multi-Cut Lathe, with its many tools cutting simultaneously, cuts the number of operations—cuts spoilage— cuts man hours . . . provides you with the functionally correct means to produce at a better profit. Available in 6" and 9" sizes.

★

SINCE 1887

the world has been turning to LeBlond for turning equipment.

★

WRITE FOR CATALOG!

TO HELP YOU RECONVERT

Our field engineers are at your service to help you in your development work, particularly along the lines of the difficult, the "out-of-the-ordinary" turning problems. We offer you the accumulated knowledge of every manufacturing trend in good times and bad—war and peace—gained over a period of nearly 60 years from thousands of installations all over the world. Contact our nearest dealer or write Dept. FE 46.

KEEP BUYING BONDS AND KEEP THEM

THE R. K. **Le BLOND**

MACHINE TOOL CO., CINCINNATI 8, OHIO, U. S. A.

NEW YORK 6, Singer Bldg., 149 Broadway, WOrth 2-0722

CHICAGO 6, 20 North Wacker Drive, STA 5561

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

1,000,000 machine operating hours

give Gulf Technologists new facts on ball bearing lubrication

THE BEARING TEST MACHINES shown below have been operated for over 1,000,000 test hours to develop better lubricants for ball bearings. These machines operate twenty-four hours a day when in use, and tests of as much as 20,000 hours without bearing failure have been made on a single application of a Gulf quality grease!

Gulf technologists have devised many kinds of special apparatus and equipment which duplicate or closely simulate service conditions, so that the performance values of lubricants can be predetermined. To this is added knowledge gained through field contacts with thousands of plant problems each year. Result: improved lubricants with better performance values which help industry increase production and reduce maintenance costs.

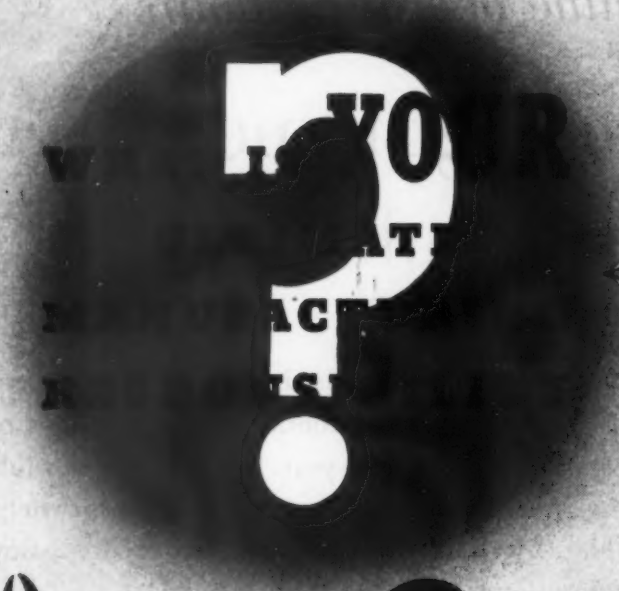
If you have a lubrication, cutting, or quenching problem, let Gulf co-operate with you in developing the best solution. Write, wire, or phone your nearest Gulf office today and ask a Gulf Service Engineer to call.

The grease testing machines shown above are only a small part of the highly specialized equipment employed by Gulf technologists to develop improved lubricants for specific requirements.

GULF INDUSTRIAL LUBRICATION

Gulf Oil Corporation • Gulf Refining Company

Division Sales Offices: Boston • New York • Philadelphia • Pittsburgh • Atlanta • New Orleans • Houston • Louisville • Toledo



DEVELOPMENT?

ENGINEERING

SERVICE?

PRODUCTION?

Isn't it Distribution?

● All of the intended benefits and usefulness of your product—the brain-beating which conceived and fashioned it; the sweat, toil and risk-taking which produced it—depend upon your determination to put improved quality products into the hands of the most users at the lowest possible price. The ultimate success of your enterprise depends on balanced, economical distribution of its results.

Production economy is usually considered a necessary first step in distribution economy; and, in view of the recently increased rate of technological development, it is logical first to explore all possibilities for maintaining low unit costs of production. With probable higher labor costs ahead of us, it is evident that we can attain low production cost per man-hour only through improved machinery, improved methods of processing and improved methods of distribution.

Micromatic Microhoning—the newest desirable, high production method of final precision machining of cylinder bores—has already made substantial

improvements in quality, and cost reductions in a wide range of products in the automotive, aircraft, diesel, refrigeration, compressor, anti-friction bearings and other manufacturing industries. It can remove a large amount of metal without damaging the subsurface structure; it has eliminated one or two steps in the final processing of cylinder bores in many parts.

In this processing, a tool carrying several abrasive sticks is revolved while also being stroked in a simple or compound reciprocating motion. Applicable to internal and some external cylindrical surfaces, it removes metal at rates ranging up to .008 to .010 on diameter per minute; and in quantity up to .070 to .080 on diameter, or volume as high as 75 cubic inches per hour. It corrects errors of previous processing and generates true roundness, bore wall and axial straightness in a majority of applications within tolerances ranging from .0001 to .0005. It is available with automatic size control which holds size uniformity within .0001 to .0003 in high production.

MICROMATIC HONE CORPORATION

DETROIT 4, MICHIGAN

MICRO MATIC

FUNDAMENTAL TO LOWER COST, VOLUME PRODUCTION ARE MODERN TOOLS SUCH AS

MICROMATIC HONING MACHINES

Industry after the war will need modern production tools as much as it will need modern distribution methods. Micromatic Honing Machines have developed rapidly to ultra-modern, high speed tools for final precision machining.

MICROMATIC MODEL 702

VERTICAL HYDROHONER

Standard single spindle type—built for rapid production honing of bores or cylindrical surfaces up to 2" in diameter.

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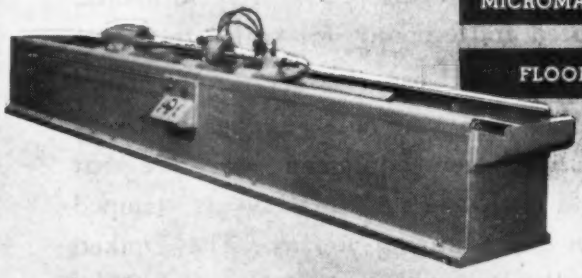
with built-in automatic Microsize Control. For internal honing. Rotary indexing work table provides high production. Usually recommended for maximum stock removal ranging from .0005" to .0015" on hardened parts—.001" to .010" on soft or medium hard. Bores from ¼" to 2" diameter. Microsize control gauges work automatically. Work is held uniformly within tolerances of .0003". Honing cycle is automatically stopped when correct size is reached.

MICROMATIC HORIZONTAL

FLOOR TYPE HYDROHONER



for internal or external honing. Tool operates either under hydraulic or manual control. Tools available to generate either crosshatch or co-directional finish patterns. Full floating tool action. Stock removal .0015" to .002"—precision generated size limits .0003". Corrects error for taper to within .0001" limit. Size of work accommodated 1" up.

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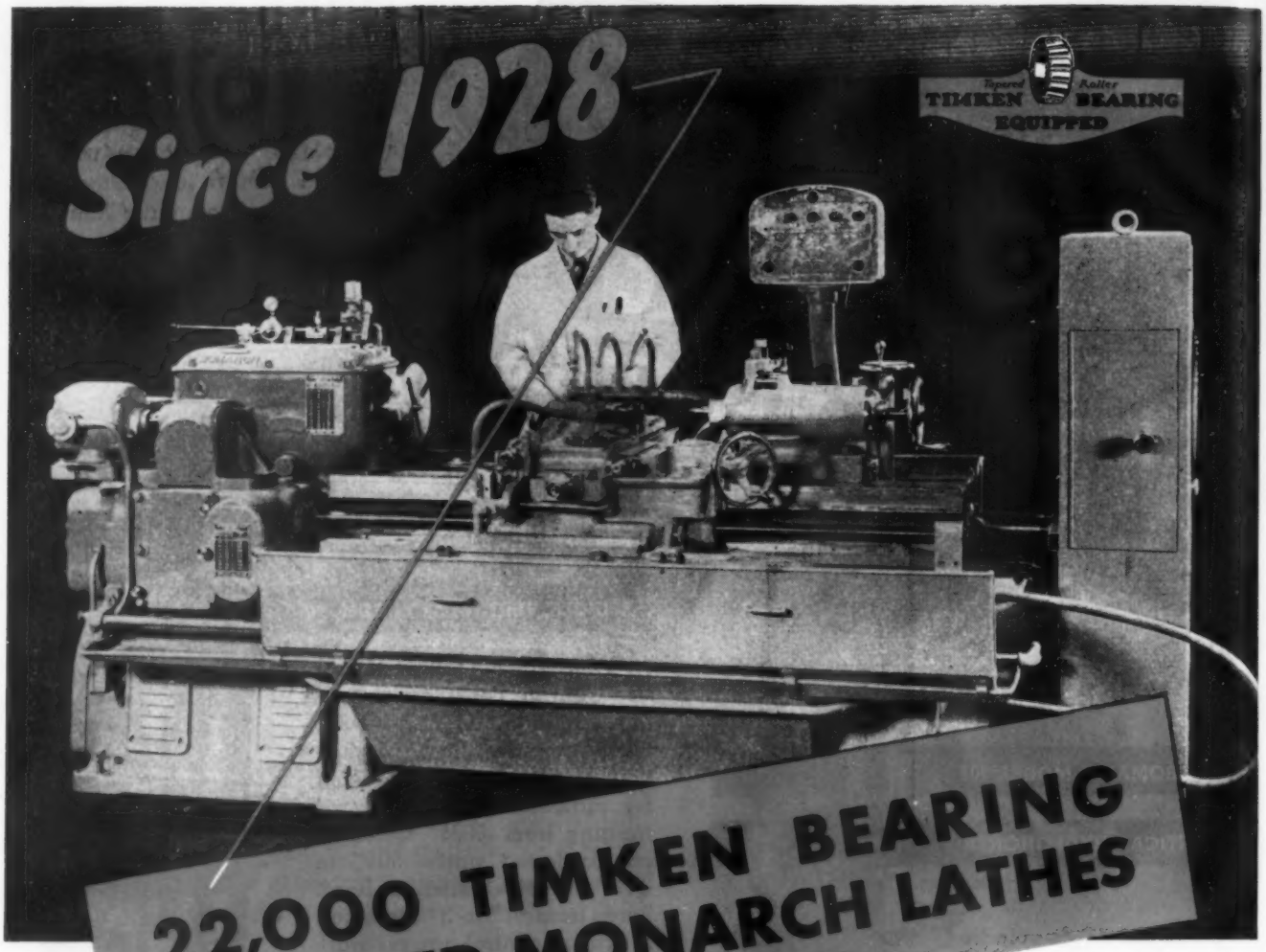

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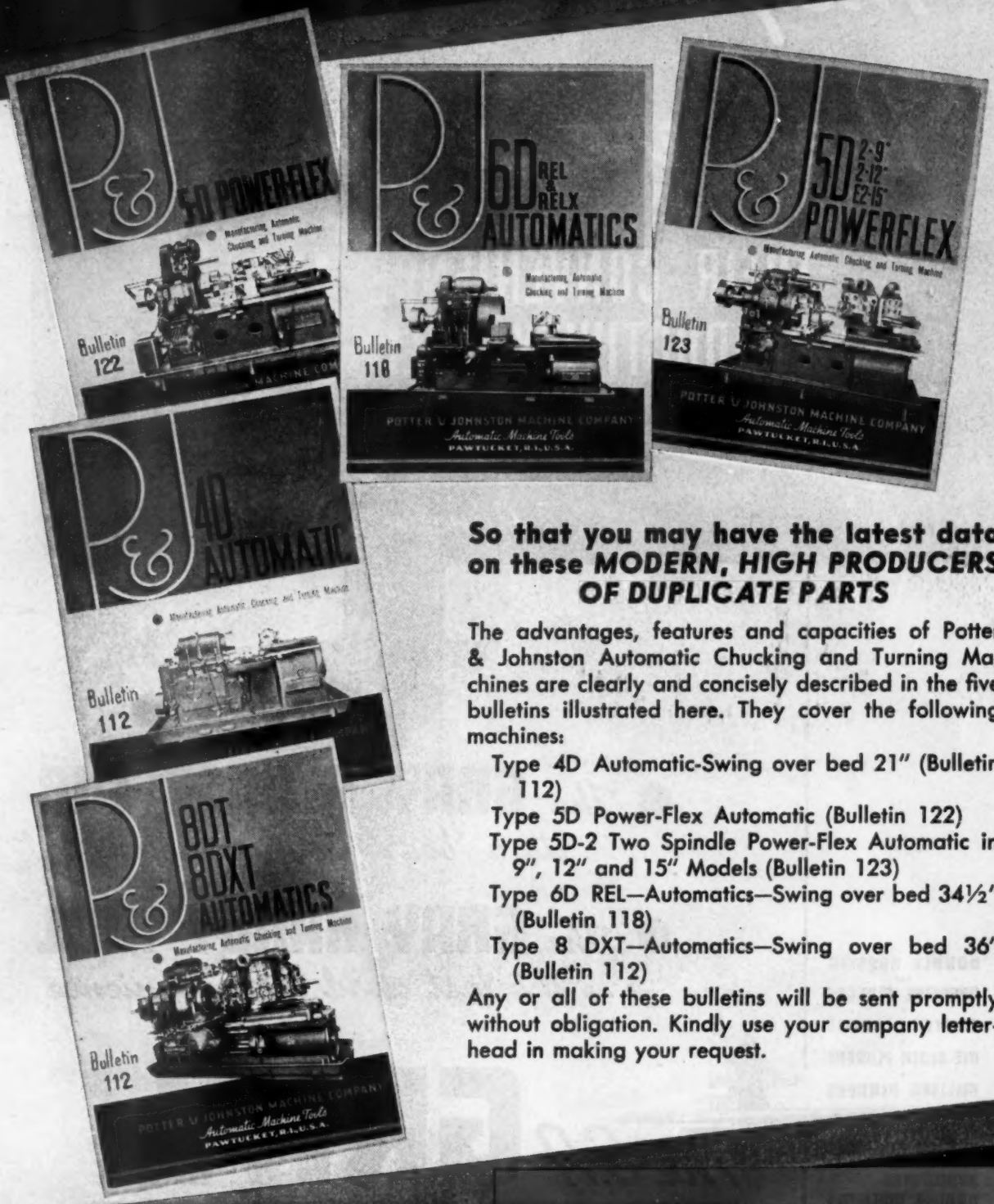

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- Type 5D Power-Flex Automatic (Bulletin 122)
- Type 5D-2 Two Spindle Power-Flex Automatic in 9", 12" and 15" Models (Bulletin 123)
- Type 6D REL—Automatics—Swing over bed 34½" (Bulletin 118)
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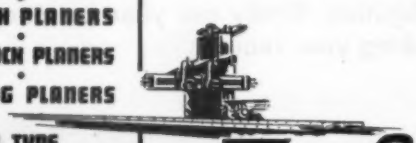

The G.A. **GRAY** *Co.*

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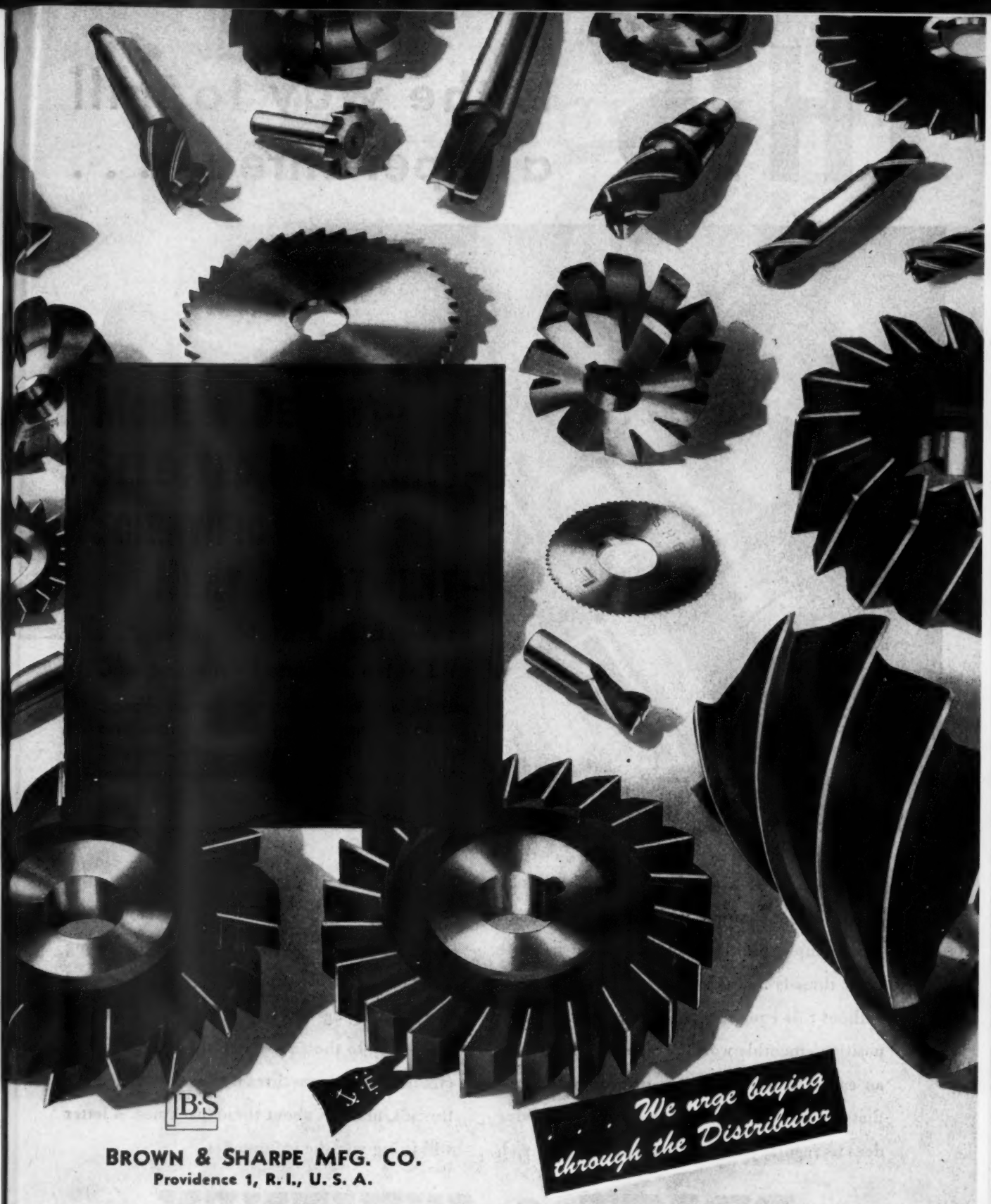

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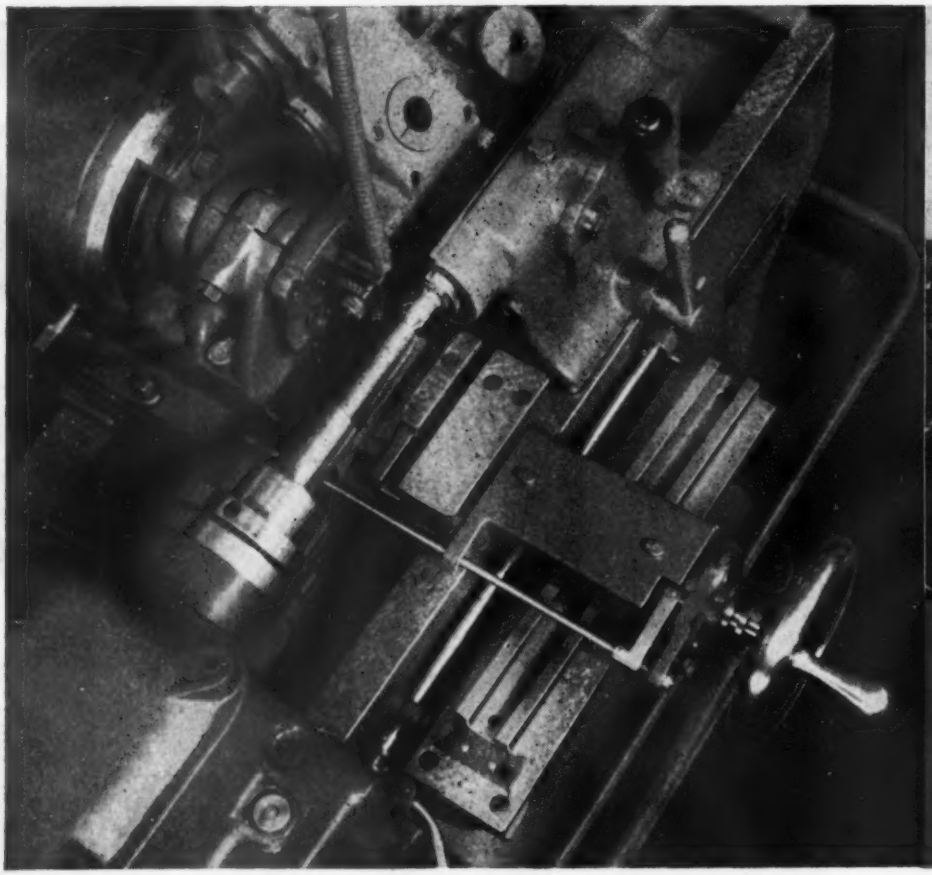

The machine is a standard Pratt & Whitney Thread Miller equipped with a taper attachment. It's a simple, positive way to produce accurate taper threads . . . a job that would be difficult without this equipment. The "secret" is in that positive, smoothly working taper attachment . . . an easily adjusted path for the follower block that moves the cutter in or out. The machine does its regular job of milling a precision thread, and the attachment guides the cutter along the desired taper.

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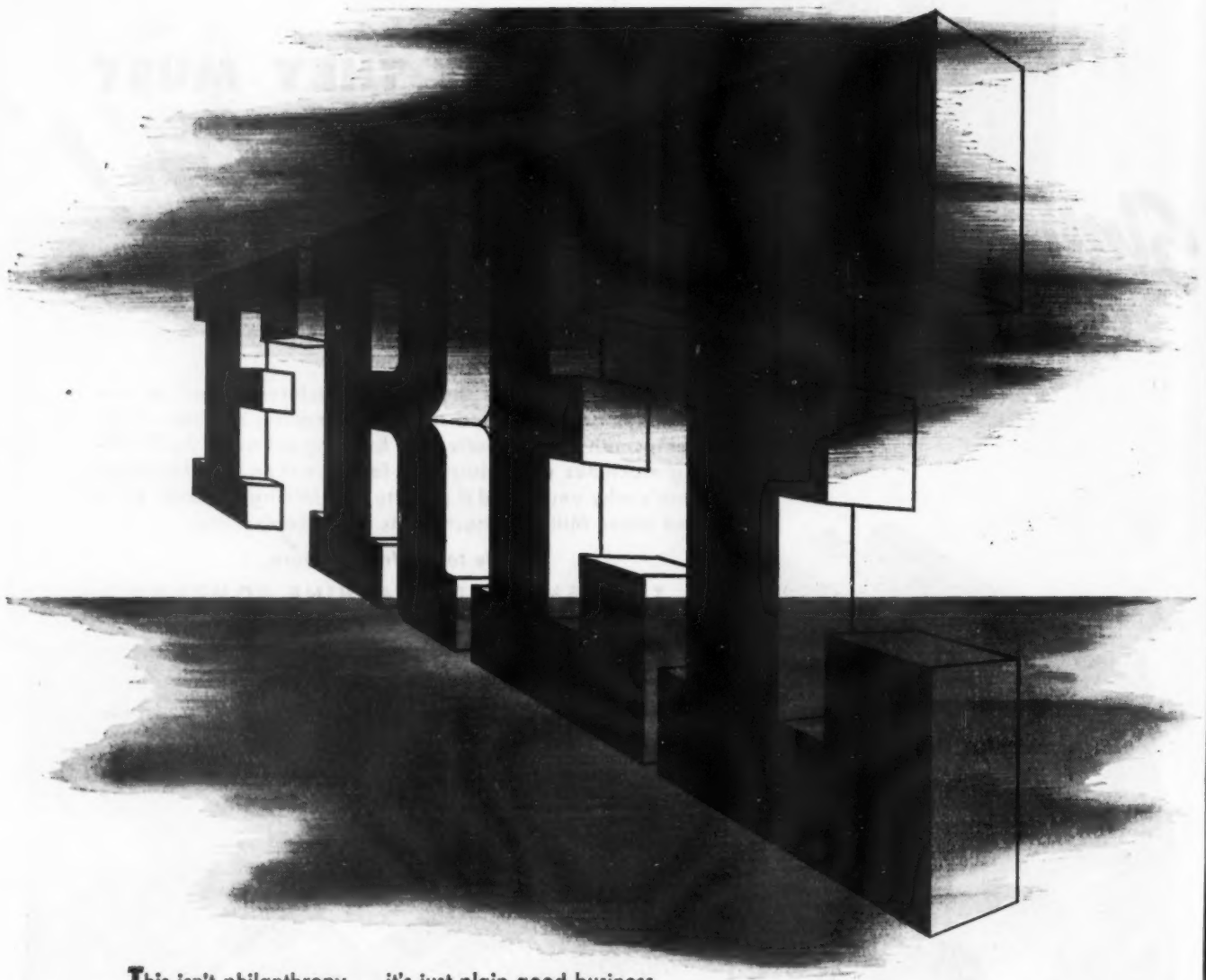

This isn't philanthropy . . . it's just plain good business.

We're in a position today to offer a very special service to American industry, and as a result, we in turn should stand to benefit from it.

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Exclusive of government-owned machinery, 54 per cent of installed metal-working equipment in the United States is over 10 years old, and a huge percentage of *all* equipment has been driven far beyond its limits of efficiency.

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In view of this critical situation, the service we're offering manufacturers today consists of *first* . . . assistance to you in appraising the cost efficiency of your internal grinding machines against that of the best available War Surplus machines, or new machines. And *second* . . . assistance to you in cutting costs on internal grinding operations by the application of the most advanced data and knowledge available in our basic specialized field of internal grinding.

Send for the Man from Bryant

*American Machinist inventory of metal-working equipment, Bulletin 1450.

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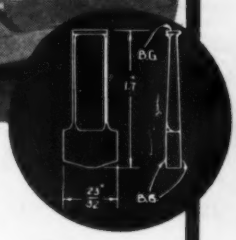

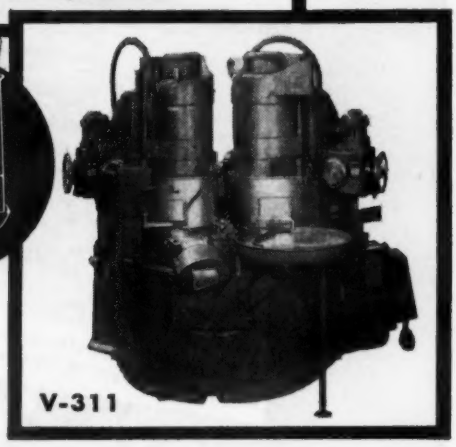

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RECONVERSION may bring you new grinding problems, but you can be sure of finding the right wheels to solve them in the Norton line—and stocked handy to you.

There are wheels in several varieties of Alundum abrasive (including the new record-breaking 57 Alundum) for grinding steels and steel alloys; wheels of Crystolon abrasive for cast iron, brass, and the light metals; and Norton diamond wheels for the carbides, glass, porcelain, and other unusual jobs. Bonds include B-E vitrified, resinoid, rubber, shellac, and silicate. And of course there's the patented Norton Controlled Structure process of manufacture.

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The Cincinnati Planer Company says that this Cincinnati Bickford Super Service Radial Drill, working on Feed and Rapid Traverse Boxes, has brought accuracy, speed, ease of handling and economical performance to the job.

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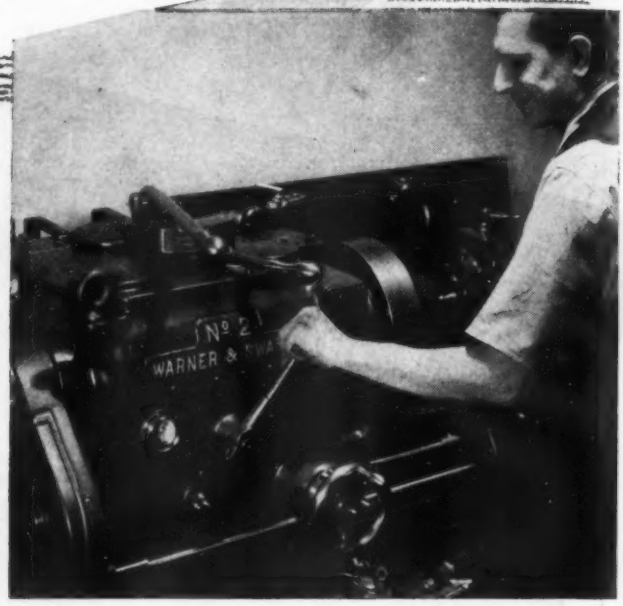
See our condensed catalog in Sweet's File

THE CINCINNATI BICKFORD TOOL CO. **Cincinnati 9, Ohio U.S.A.**

WHICH "Surplus" WARNER & SWASEY IS RIGHT FOR YOUR JOB?



Just as the same sized hat will not fit every man, the same model Warner & Swasey Turret Lathe and set of tools is not best adapted to every job. Over a period of years, our engineers have designed and perfected a whole series of models and tooling set-ups purposely to help you get the very utmost in production. And in a new machine sale, our field engineers make certain that every customer gets the one that's right for his job!

Today, however, many government-owned surplus Warner & Swasey Turret Lathes are available. If you are planning to invest in a surplus Warner & Swasey—which you must buy "as is", contact our nearest Branch Office. After obtaining the model and serial number, all you need to do is give us this information. We will send you the date of shipment of the turret lathe—the way it was equipped when it left the factory, and the types and sizes of work for which we believe it is best fitted.

Write to us here in Cleveland, or see our nearest Branch Office. We'll be glad to help you get the most out of any Warner & Swasey you buy!

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The "Buyers Guide" will prove a valuable aid in helping you determine the proper Warner & Swasey Turret Lathe to suit your needs in the purchase of surplus turret lathes. To get a copy, just write to us here in Cleveland or contact your nearest Warner & Swasey Branch Office.

You can Machine it Better, Faster, for Less... with a Warner & Swasey

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TURRET LATHES, SADDLE AND RAM TYPES—CHUCKING AND BAR TOOLS—PRECISION TAPPING AND THREADING MACHINES

Productivity the Key

ALMOST every manufacturing and service industry is short of help, despite stoppage of war production and the discharge of hundreds of thousands of men by the Army and Navy.

Men just don't want to work. With the war's end, people who have done their jobs steadily for several years, working 48 to 52 hours a week, are taking time off to fish and loaf.

That in itself is a natural reaction that would not cause concern were it not for the fact that it is tied with a national movement to get more pay for less work.

Let's get one point straight: the average manufacturer is not opposed to high wages in themselves. He realizes, even more than his employees, that if people are to buy the goods made by American industry, they must have money in their pockets.

If people are to secure the automobiles and radios and refrigerators and other goods that they want, at prices within their reach, they should soon be willing and ready to return to work.

Beyond that, they should give an honest day's work for an honest day's pay.

Our country's wealth springs from one source only—productivity. The high productivity of the average American worker is the distinguishing mark that sets him off from the workers of all other nations.

The attainment of that mark has been made possible by the mechanical aid given him by machines.

His productivity is responsible for higher wages, for the purchasing power that gives him more material comforts than are enjoyed by any other worker in the world.

If wages are to go still higher, the volume of work done by the average worker must rise from today's level instead of trending in the other direction, as it has in many companies.

It is a truism to say that if wages go up and productivity stays constant or declines, and the profit margin is lean, the only path that prices can take is up.

But if wages advance and productivity increases, there is at least a fighting chance that no increase in prices will be necessary.

Productivity, then, is the key. High productivity spells high wages and a high standard of living for our people. Low productivity erases the advantages that we have had in material things compared with other nations.

The choice is ours. If we cling to the false philosophy that the government owes us a living, that each person must not work harder than a low average for the group, a high-cost, low-yield economy is inevitable.

If, on the other hand, we raise still further our productivity per man, making full use of the new machines available to industry, we can afford to pay high wage rates and to sell goods cheaply.

It is true that productivity can be increased by the increasing utilization of machines which enables the worker to multiply his own output; but that statement presupposes the worker's willingness to do his best on the job. That is why the pay the worker receives should be related to his output as well as to the time clock.

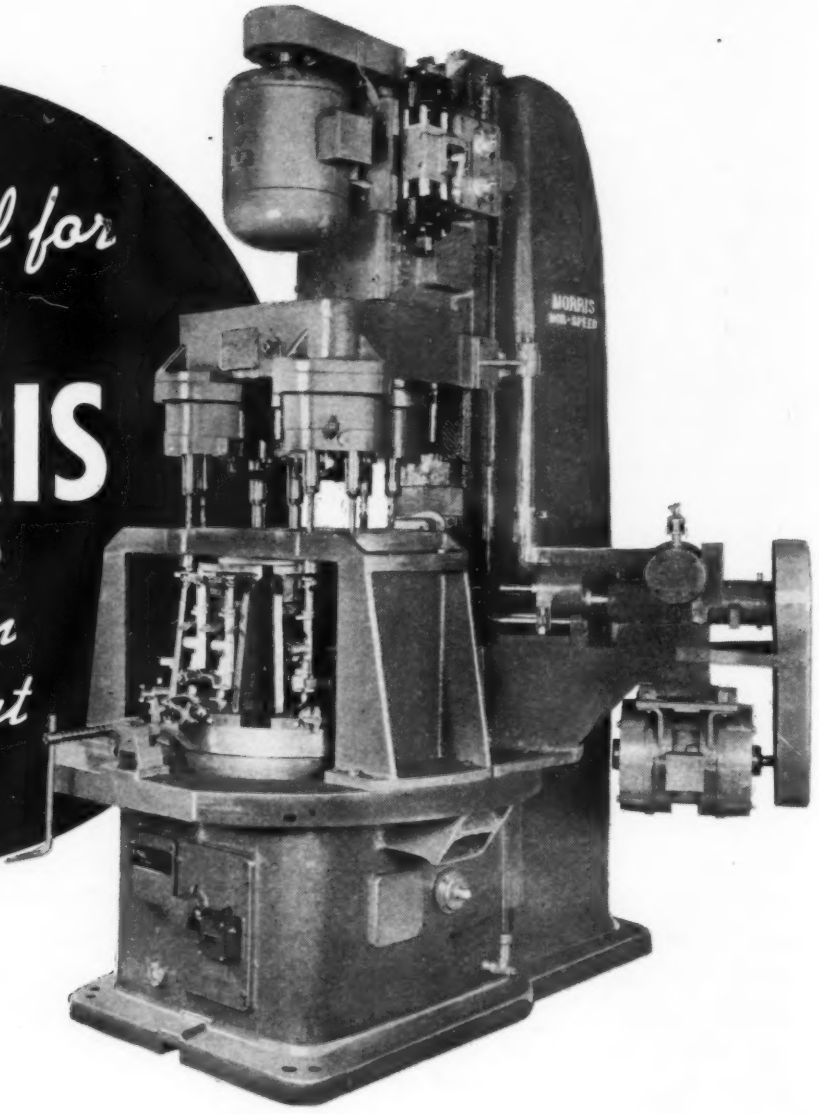
Burnham Finney

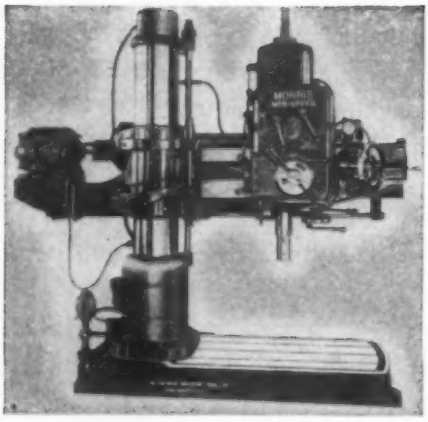
Engineered for the job

MORRIS

MOR-SPEED

High Production Equipment





● This High Speed Vertical Machine was developed by Morris to meet the high production requirements of a specific job.

Mounted on the column is an eight spindle head with individual motor drive. A side head mounted on the table contains two horizontal spindles.

The work holding fixtures are automatically indexed to six positions to handle successively drilling, reaming, facing and counterboring of oil pumps.

Consult Morris on high production equipment for drilling, reaming, boring, facing and counterboring operations. They have the Engineers — the organization — the facilities to help you on your mass production problems.

Builders of **MOR-SPEED** *Radials*

The **MORRIS** *Machine Tool Co.*

CINCINNATI 3, OHIO

Annealed Aluminum Alloys RESPOND TO Hot Forming

Higher forming limits attained for certain aluminum alloys at elevated temperatures result of reaction of lubricant to heat

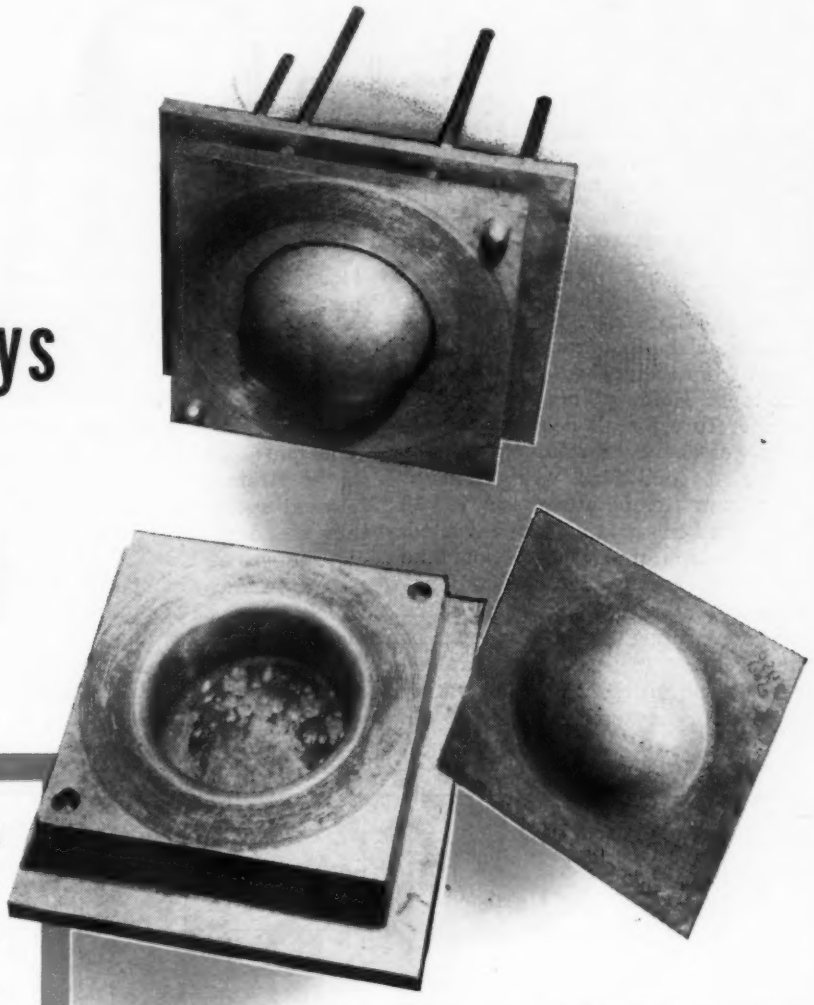


Fig. 1—A bulge of maximum depth is the practical requirement for this punch and die for mechanical bulging of 10-in. square aluminum-alloy sheet

BY GEORGE SACHS, GEORGE ESPEY AND W. F. BROWN
CASE SCHOOL OF APPLIED SCIENCE

THE BEHAVIOR of aluminum alloys when stretched or formed at elevated temperatures presents varying commercial possibilities. In mechanical circular bulging, involving biaxial stresses, some alloys show increased formability with increased temperature, particularly in the annealed condition. The importance of proper lubrication, at elevated temperatures, is clearly indicated.

To survey the effect of elevated temperatures on mechanical bulging, 20 different conditions of six alloys, 3S, 52S, 61S, 24S, R301, and 75S were investigated in plant tests. High-strength alloys were tested in the clad conditions, while the various conditions of 24S were tested with both the bare and clad surfaces. All sheet formed in the test was 0.040 in. thick. The various alloys, classified according to condition, are:

Group I—A Annealed Non-Aging
Group I—B Annealed Heat-Treatable
Group II—A Room-Temperature Aged
Group II—B Artificially Aged

Tests were carried out on an inclinable 5-in. openback power press, operating at 50 strokes a minute. An 18.6-ton pneumatic cushion provided necessary hold-down. The bulging tools, of hot-rolled steel, were polished with fine emery paper. Surfaces of both the pressure pad and die were serrated with sixteen 30-deg., 1/32-in. buttress teeth to the inch to prevent the alloy sheet from slipping.

Die and punch were heated by conduction form platens contain-

ing internal electrical resistance heaters. Platen temperature was maintained from 50 to 100 F. higher than that of the tools by means of thermoswitches at both ends of the platen. Heated platens were insulated from the press by ½-in. thick transite.

A third electrical heating platen was used to preheat the alloy sheets before positioning in the tools. Temperature of the sheet and various parts of the tooling was determined to within plus or minus 15 F.

Specimen sheets for the bulge test were 10 in. square, photogridded on one side and preheated to approximately 50 F. above forming temperature to compensate for heat losses encountered in transferring the sheet from the preheating platens to the tools. Holding time at maximum temperature for all heat-treated alloys was about one minute, while the annealed conditions were held at maximum temperature up to 10 min. with the grid surface inverted.

Minimum temperature of the sheet was measured immediately before testing and it was found to be uniform throughout within plus or minus 15 F. In the lower temperature range, up to 350 F., the difference between temperatures of the

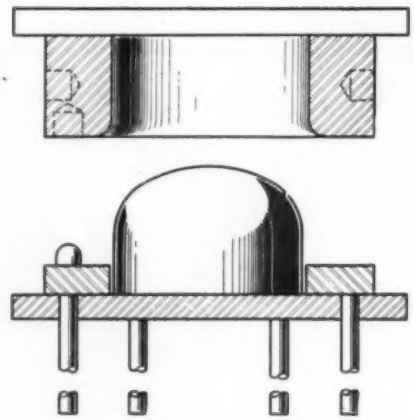


Fig. 1—A serrated pressure pad is used to prevent the specimen sheet from slipping in this tool assembly

punch, die and pressure pad and the sheet-forming temperatures was about plus or minus 50 F. An analysis of strain distribution on some selected specimens did not indicate that the deviating temperatures of die, punch and sheet affected the strains in the test specimen, a fact which may be explained by the high speed of forming.

A deep-drawing oil and a pure commercial soap used as lubricants were applied to that portion of the sheet which contacted the punch. Lubricant was also applied to the punch surface just before forming a series of sheets. After lubrication the sheet was quickly transferred from the pre-heating platen to its rest on the pressure pads, remaining there for 15 to 30 sec. to attain a uniform temperature. Temperature at the center of the specimen was recorded just before forming.

The forming limits to be investigated were taken as the maximum meridianal strains in the bulge. These strains were measured in the plane of the sheet parallel to and along both the longitudinal (parallel to grain) and transverse (perpendicular to grain) axes for a distance 2½ in. either side of the pole. Strain measurements were made over a ½ in. gage length at ¼-in. intervals. No attempt was made to measure strains in the plane of the sheet ¼ in. on either side of the fracture.

Effect of the lubricant was pronounced. After the first few tests the oil was abandoned and the soap was used for the remaining investigations. For nearly every alloy investigated with an oil lubricant, strains were considerably higher at room than at elevated temperatures,

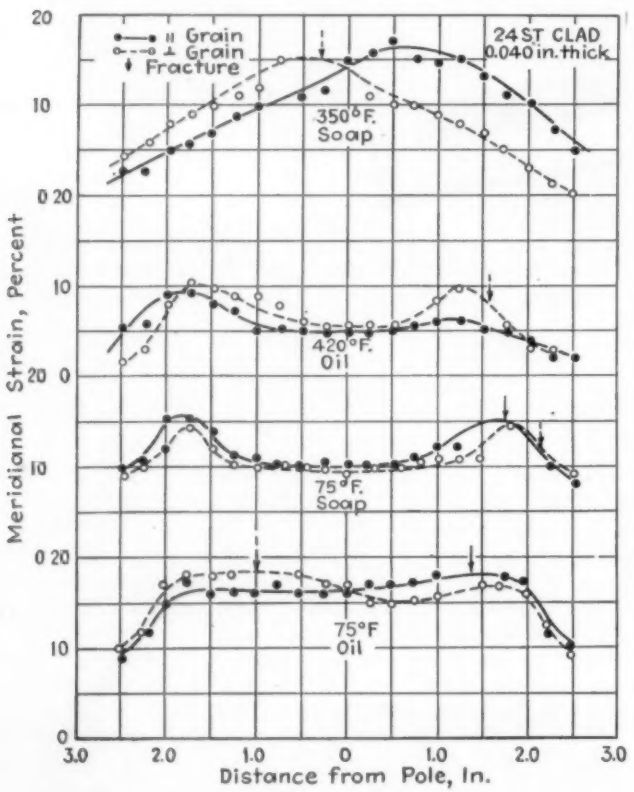


Fig. 3—With soap as the lubricant, maximum radial strains in 24ST clad move from the periphery to the pole of the bulge at high temperatures

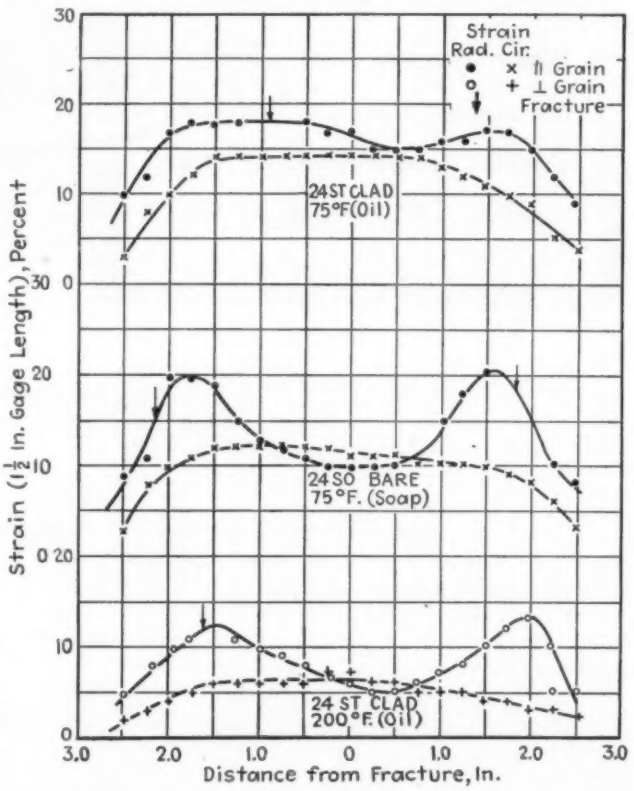


Fig. 4—Distribution of strains in mechanically formed bulges are more complex and irregular than those set up by hydraulic bulging

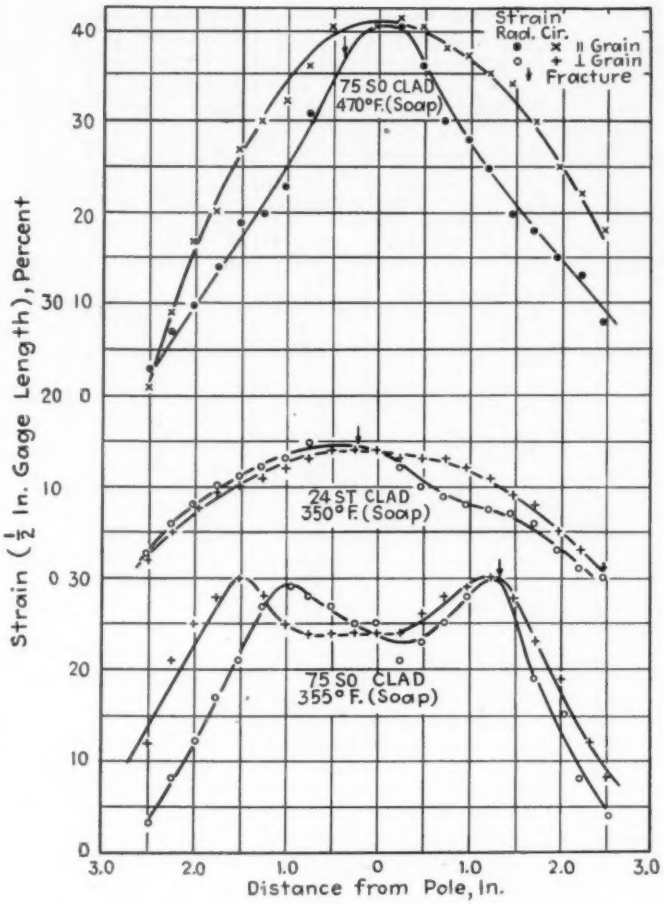


Fig. 5—Meridianal and latitudinal strains agree closely only in the immediate vicinity of the pole, constituting balanced biaxial stress in this region

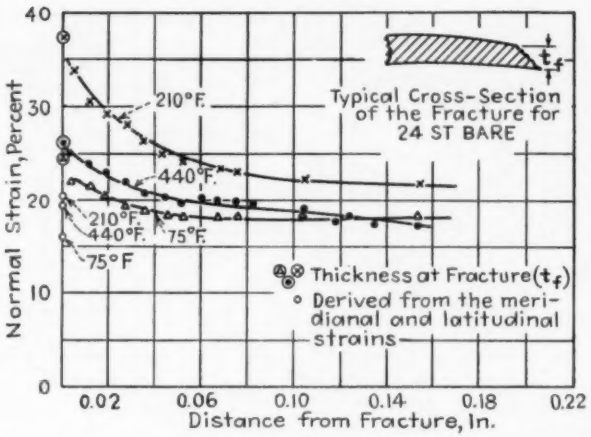


Fig. 6—Thickness measurements provide a means of determining the strain distribution in the vicinity of the fracture, including the strain at the point of failure

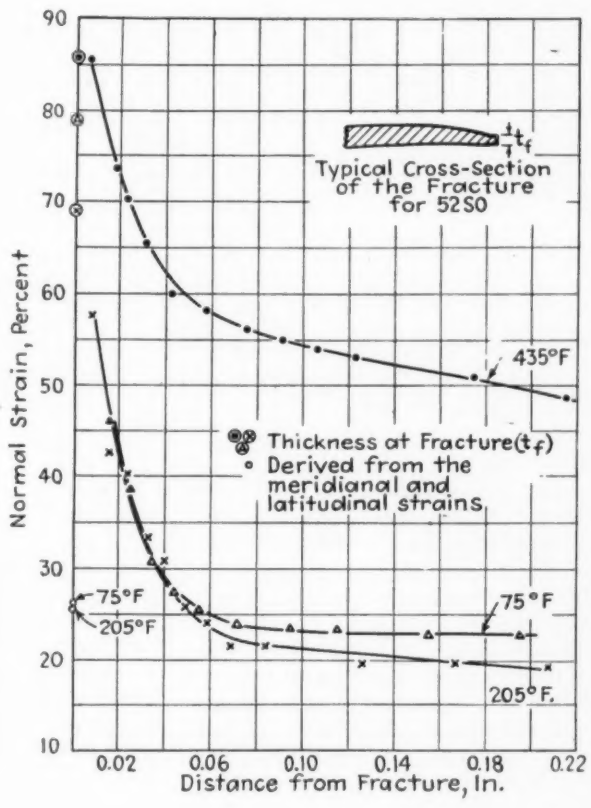


Fig. 7—Thickness measurements at three different temperatures indicate local necking or mechanical instability over a much wider range than is encountered in hydraulic bulging

as shown in Figs. 8 to 13. This general effect is explained by a gradual breakdown of the lubricating action of the oil, its influence entirely masking the effects of elevated temperature on the material. The frequent high strain values observed at room temperature indicate that this oil possesses favorable lubricating qualities at this temperature, while the assumed deterioration of the lubricating action accounts for the strain values at temperatures of 200 F. and higher being considerably below those obtained with soap.

On the contrary, the strain values observed at various temperatures when soap was used as a lubricant reveal that the frictional properties of this lubricant are improved by elevated temperatures up to 500 F. This is illustrated by the displacement of the maximum radial strains, Fig. 3, from a position close to the periphery of the contact area at low temperature, to the pole of the bulge at high temperature with soap as the lubricant. This can be caused only by a decrease of the friction coefficient with increasing temperature. With oil as a lubricant the frictional coefficient either increases or remains materially the same with increases in temperature, as is evidenced by the double maxima often present above 300 F.

The strain state and distribution of a hydraulically formed bulge is one of balanced biaxial strain, increasing in magnitude to the pole. The curves resulting from such a distribution possess a flat and quite definite maximum at the pole for the aged alloys. The distribution of these strains, Fig. 4 and 5, in any one of the mechanically formed bulges is much more complex and irregular than in a hydraulically formed bulge. In most cases the strains in the meridianal and latitudinal direction agreed closely only in the immediate vicinity of the pole, while their ratio at other locations was anywhere between 0.5 and 1.0 percent. Consequently, balanced biaxial stress was present during a test in a region immediately adjacent to the pole.

Depending on the frictional conditions and the alloys, Fig. 4 and 5, meridianal and latitudinal strain distribution curves exhibited either

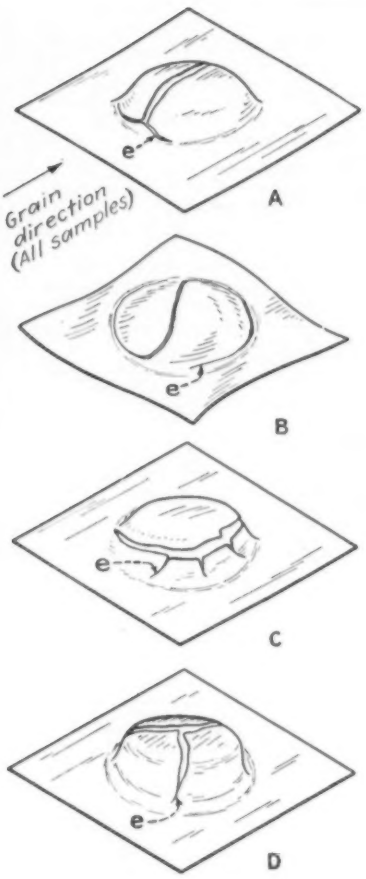
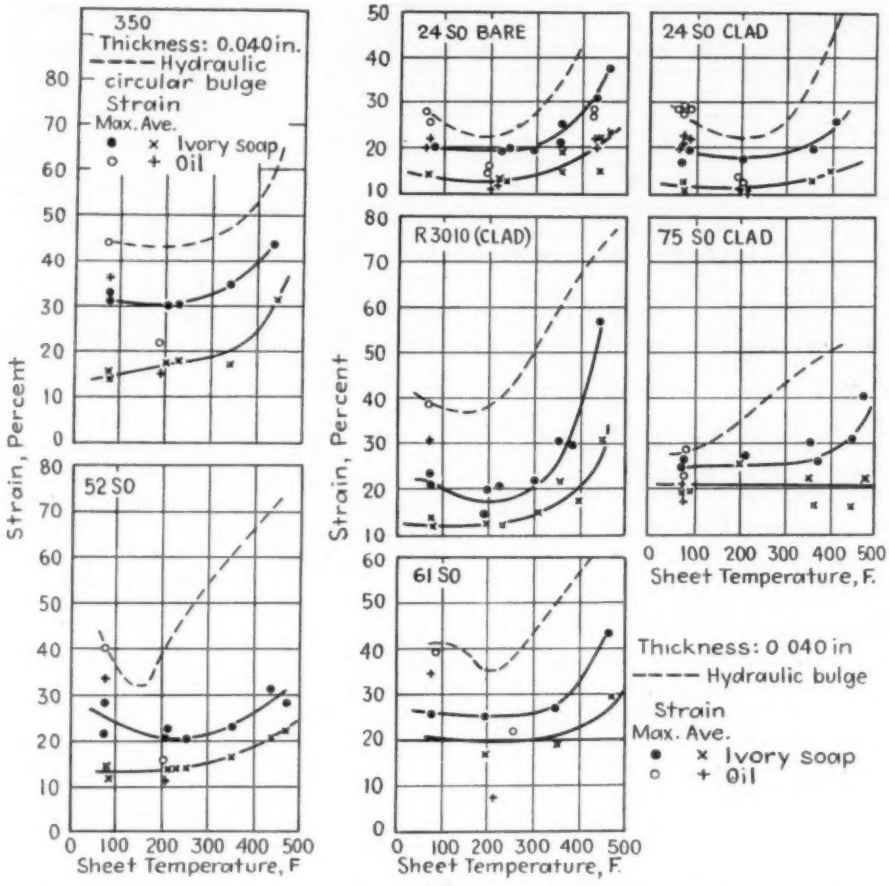


Fig. 8—Failure occurs along principal axes of bulge, type C being an exception



Figs. 9 and 10—At temperatures in excess of 350 F., the forming limits of both aging and non-aging aluminum alloys show a decided increase, particularly with a soap lubricant

one or two maxima. A distribution with a maximum (or sometimes two maxima) in the immediate vicinity of the pole was also characterized by rather close agreement between the meridianal and latitudinal strains along the complete contour.

Failure generally occurred in any bulge at a point where the meridianal strain exhibited a maximum. The variables such as the alloy, the temperature and the selected lubricant determined this point of maximum strain and, correspondingly, the locus of failure. These conditions in turn should affect the maximum strain at which failure occurs, if the forming limit depends on the stress state. According to preliminary results on hydraulically formed bulges, higher maximum strains should occur under balanced than under unbalanced biaxial tension. This agreed with the observations on the mechanically formed bulges, which exhibited smaller maximum strains where failure occurred at the periphery under stress ratios considerably below unity than at the pole of the bulge.

The practical requirement is to form a bulge of maximum depth. This means that the strain distribution should be as uniform as possible. To approach this ideal distribution, the natural tendency of the bulge to strain greatest in the center must be compensated for by a lubricant exhibiting just the right frictional coefficient. However, no general rule can be given for achieving such a purpose as different metals generally exhibit different strain distributions, both with and without a particular lubricant.

Types of Failure

Four types of failure are shown in Fig. 8. It appears that fundamentally the failure is either along one of the principal axes of the bulge, as in types *A*, *B* and *D*, or occurs circumferentially near the periphery of the punch as in type *C*. Types *A*, *B* and *D* are characteristic of of the lower frictional coefficients and are associated with the highest forming limits for a given alloy. Type *A* or *D* failures are encountered under favorable frictional conditions for all alloys tested. Type *D* occurs at temperatures above 400 F. and at intermediate temperatures for 75SO clad. Type *B* is a brittle failure, similar to type *A* but occurring at some angle to one of the principal sheet directions. The artificially aged conditions of 24S fracture according to this pattern.

Circumferential failures of type *C* are associated with the higher frictional coefficients for all alloys except the artificially aged 24S. The fracture extensions designated as (e) are due to excessive press stroke and vary in magnitude and extent with the depth of the stroke.

A pronounced tendency to slip, even at maximum hold-down pressures, was shown by 24ST and 24SRT, both bare and clad. This was also true of 24SO bare and clad, but to a lesser extent. The heat-treated alloys showed a tendency to heat-warping after preheating, an effect which was particularly pronounced for artificially aged and rolled 24S.

The forming limits of all the annealed alloys, Groups I-A and I-B, Figs. 9 and 10, increased considerably

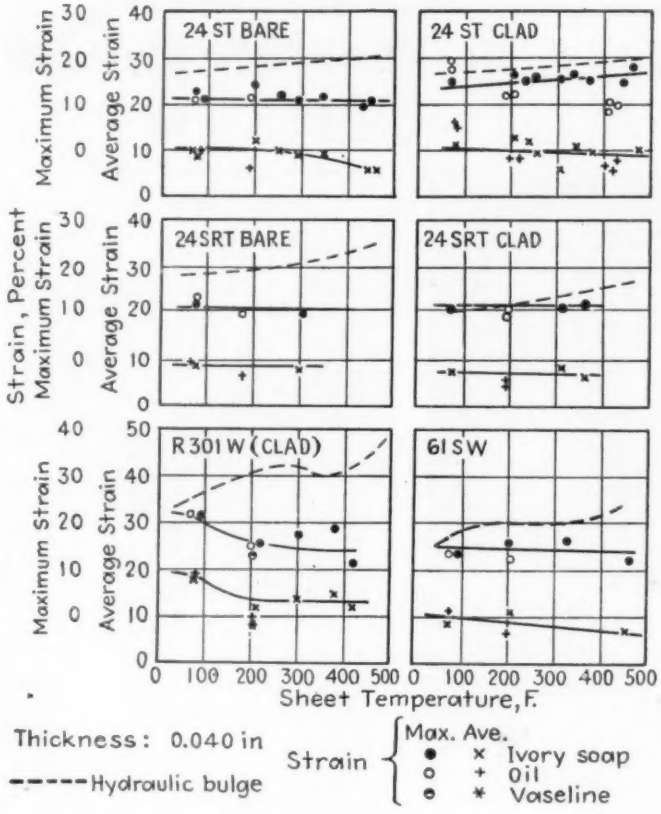
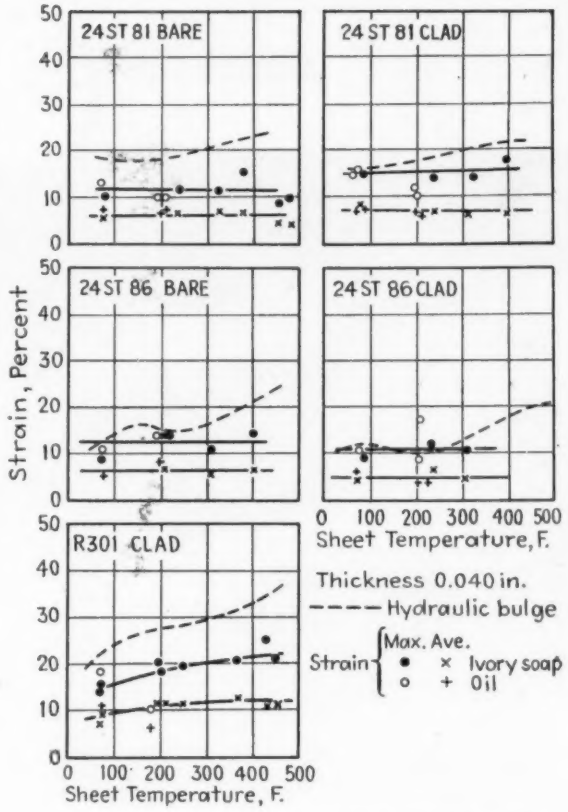


Fig. 11—No appreciable change in the forming limits of alloys aged at room temperature is indicated with increasing temperature in mechanical bulging



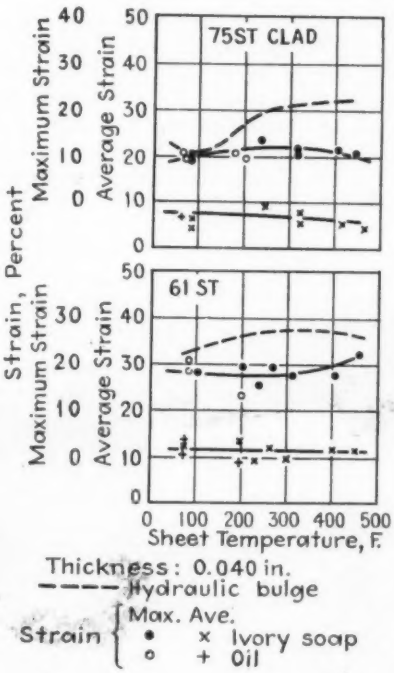
Figs. 12 and 13—Only R301T clad shows any increase in forming limits for the artificially aged aluminum alloys, particularly when a soap lubricant is used

at temperatures in excess of 300 to 350 F. while at lower temperatures they remained approximately constant. For these alloys, possessing rather high values, forming limits were substantially lower and forming limits less pronounced in mechanical bulging than those observed in previous hydraulic bulging tests.

Forming limits for the room-temperature-aged alloys, Group II-A, Fig. 11, were not appreciably affected by increasing forming temperature. Again the values were smaller throughout for mechanical than for hydraulic bulging.

Of the artificially aged alloys, Group II-B, Fig. 11 and 12, only R301T clad showed an increase in forming limit with increased temperature. A qualitative comparison of the strain-temperature curves for the alloys in this group with those obtained in hydraulic bulging indicates no appreciable difference in trend, except for 75ST clad, which showed no increase in forming limits with increasing temperature.

The average meridianal strains follow the same trend as the maximum meridianal strains, or forming limits. However, their absolute values were found to be rather close for the alloys in Group II-A, while in the other groups the average strains were approximately half of the maximum strains. This phenomenon, revealing that the alloys aged at room temperature can be die-bulged almost as deep as their annealed conditions, cannot be explained. In this respect mechanical bulging differs considerably from hydraulic bulging.

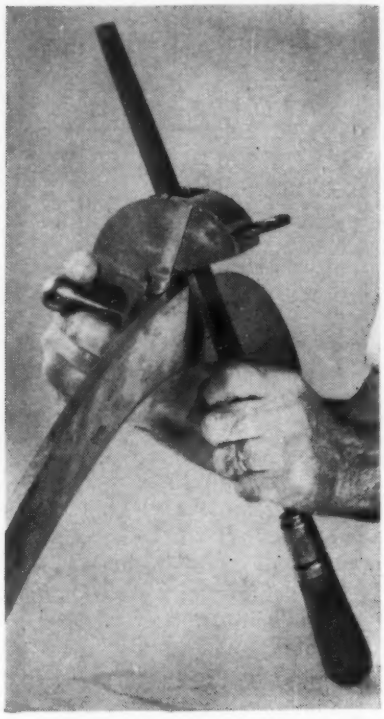


In general, it appears that for annealed alloys, some practical advantage may be gained by hot die-forming under favorable geometrical conditions. Neglecting the effects of friction, it is apparent that forming limits for various stress states obtained in elevated temperatures cannot be predicted successfully. Thus the results obtained in hot hydraulic bulging and in the elevated temperature tension tests fail to predict quantitively the effects of temperature on the forming limits in die bulging. The most important effect of temperature is its influence on the lubricant and the friction coefficient. For each testing temperature, condition of geometry and alloy there is a lubricant particularly suited to furnish maximum formability. Commercial soaps provide most dependable high-temperature lubrication.

A second installment, investigating the effects of elevated temperatures on die-stretching of aluminum alloys will appear in an early number.

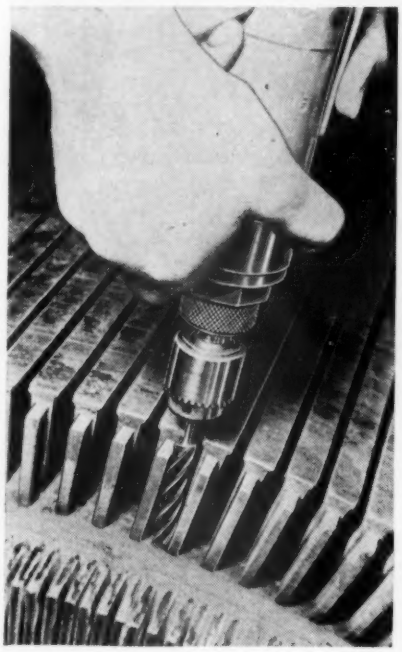
SHOP SHOTS

Forming operations on small steel tubes are readily handled in a small air-hydraulic press designed by Harry N. Nesbit. This press consists of a welded-steel frame with an adjustable bolster suitable for mounting a wide range of small pipe-forming dies. A portable "Pneudraulic" squeeze riveter drives the ram and is powered by a Chicago Pneumatic power unit mounted at the back of the press frame. Tube lengths are heated in a nearby furnace. The power unit can be operated manually, as shown, or by a pedal valve. *Lockheed Aircraft Corporation.*

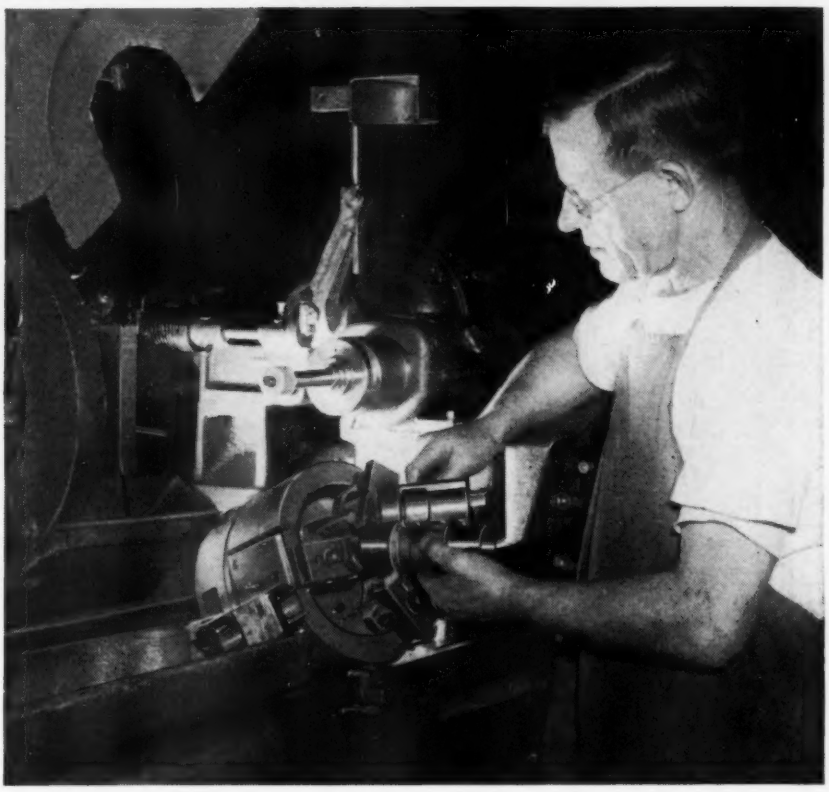


An edging file-holder designed to hold a file at any specified angle, facilitates the finishing of edges of metal strips at the exact angles required. The holder may be attached to a rigid bracket or a movable carriage, for handling bevels on a variety of materials and shapes. *Tip A. Hicks, Sr., The Glenn L. Martin Company.*

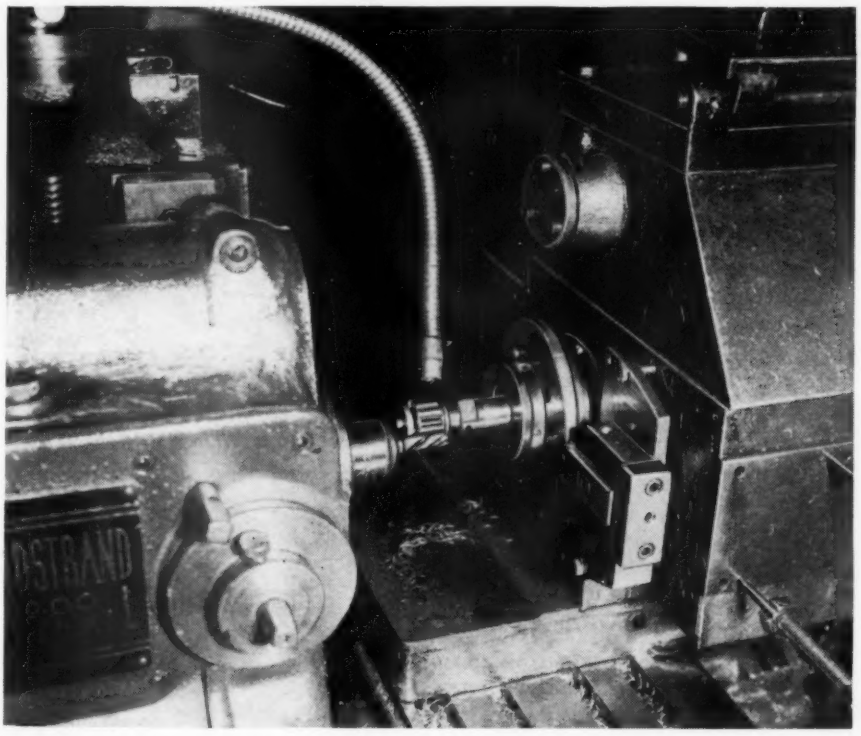
A bench-type fixture, designed for inspecting milling-cutter setups on arbors, stub arbors, shell end-mill holders and in collet-type holders enables cutter sets to be prepared well in advance of requirements. The fixture has a heavy cast-iron base with two sets of ways, one for the headstock and tailstock and the second for the indicator support. The dummy spindle in the headstock has a pin lock to prevent turning while the nut is being tightened on the arbor. Standard arbors are held in place with a drawn bar, operated by the handwheel at the left. *Charles H. Bodner, Tool Engineer, Lockheed Aircraft Corporation.*



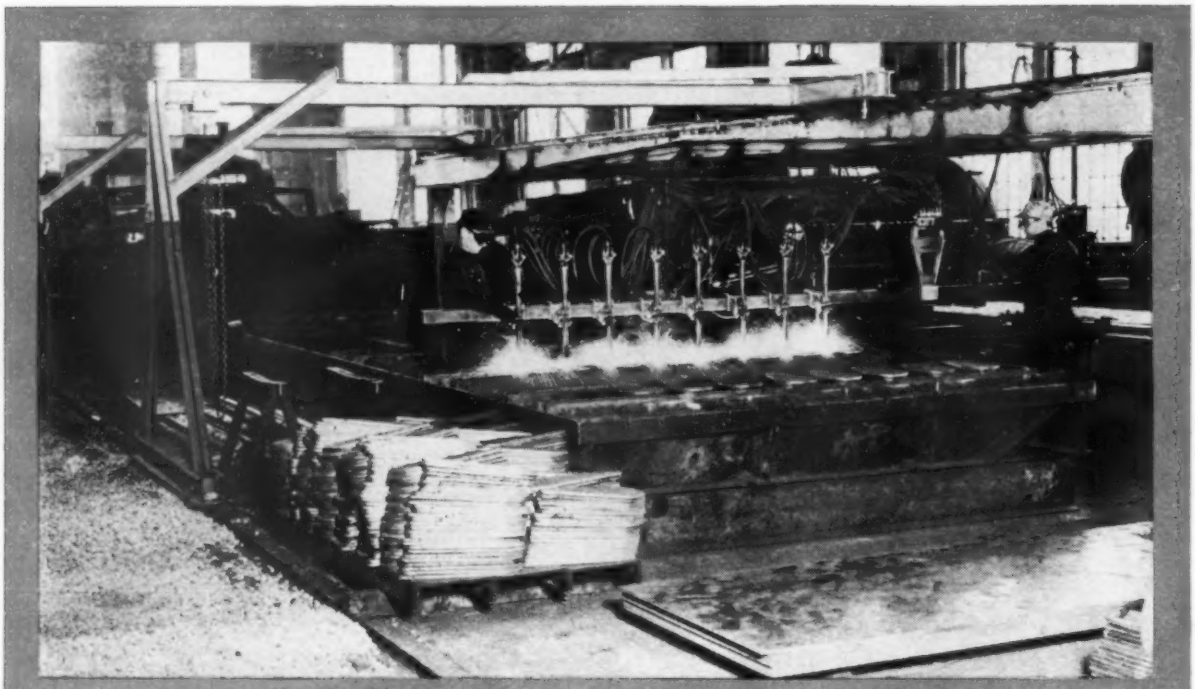
An end-mill with a recessed shank used in an air drill facilitates the cleaning of armatures and other comparatively inaccessible slots and surfaces. The recess in the shank makes it possible to move the end mill freely in the slot. The slots were formerly cleaned by tedious filing operations. *Westinghouse Electric Corporation.*



Special chuck jaws which grip tubular parts throughout their length have substantially improved internal-grinding operations. Previously, the use of regular chuck jaws resulted in parts that were high in the middle and had a double taper. Complete support for varied forms of tubing is provided by contouring. *Gene White, Douglas Aircraft Company.*



Breaker cams having 14 lobes with flute-like recesses, formerly roughed in gear shapers, are now milled twice as fast on a horizontal milling machine with a special head carrying a spindle on which the cam blank is mounted. A large master cam, close to the head and on the same spindle, engages a follower. As the cam spindle turns, the follower moves the head in and out with the work so the spiral-fluted cutter generates the required cam contour on the blank. The cycle is automatic and operators need only unload, load and start the machines—one man handling two machines. *Scintilla Magneto Division, Bendix Aviation Corporation.*



One good way to reduce down time and increase the work factor of both the cutting machine and the operator is to speed up the handling of materials on and off the worktable. Here a gantry crane was installed to speed up the handling operation

Cost Reduction Aspects Of Flame-Cutting Operations

BY DR. G. V. SLOTTMAN, APPLIED ENGINEERING DEPARTMENT
AIR REDUCTION SALES COMPANY

Design of parts, handling of material, and utilization of scrap are cited in this ninth article of a continuing series

IT IS FREQUENTLY of value to be able to estimate approximately the hourly or daily output of an oxy-acetylene cutting operation, particularly when a certain volume of production is required and the designing of cams or other aspects of the set-up may be influenced by knowledge of the output obtainable under different conditions. Such estimates are best predicated upon time studies of other, similar jobs done in the same shop.

Without this information it is difficult to calculate the output with any degree of certainty, because of the diversity of manufacturing conditions in different shops. Handling facilities, organization and quality of work affect the work factor of the cutting machine and the amount of linear cutting done per hour. However, where cutting work has been done on a real production basis for a number of years, employing a good setup, it is possible to work out an approximate production table.

A representative set of figures, which will be useful in estimating work and give prospective users an idea of what may be expected of the process, is given in Table I. These figures for cutting with one to four torches include allowances for time loss in handling material on and off the cutting table, and the cutting and removing of the resulting scrap.

In gas cutting it is usually true

that any practice which increases the hourly production will also decrease the cost of cutting. On volume work of any kind, but particularly when large quantities of the same part are to be cut, it is invariably good economy to overlook none of the many different techniques which can be applied for increasing production. These fall generally into two categories: (a) those which increase the work factor of the cutting machine, and (b) those which increase the amount of linear cutting done by the machine when in actual use.

Improved materials-handling methods will go a long way toward raising the work factor of the machine. Down time may also be reduced by spotting plate at two positions on the worktable, with the machine alternating between the two positions. This practice reduces idle time of the machine to a small percentage, since it can start a new job as soon as it has finished the previous one.

The technique cannot be used for all types of machines, however. Use of multiple templets, as described in a preceding installment, also tends to keep the machine and the operator busy on actual cutting with a minimum of unproductive time. Plate-locating devices for quick spotting of material, rudimentary or elaborate jigs, and any number of other gadgets or methods devised by ingenious operators will help to accomplish the same purpose. The list is endless, and the methods described here are intended only as suggestions.

TABLE I—AVERAGE APPROXIMATE LINEAR FEET CUT PER HR.
(Including materials handling, setting up, and cutting)

Material Thickness, In.	Number of Torches			
	1	2	3	4
¼	31.5	57.4	84.5	112.6
⅜	31.0	56.0	83.3	110.9
½	30.5	54.7	82.1	109.2
¾	29.5	53.0	79.7	106.0
1	28.7	51.6	77.4	103.0
1½	27.0	48.6	72.9	97.2
2	25.6	46.0	69.0	92.0
2½	24.0	43.2	64.8	86.4
3	22.8	41.0	61.5	83.0
4	18.6	33.5	50.2	
5	14.5	26.1		
6	11.9	21.4		

The same applies to the methods for increasing the productivity of the machine in use. Foremost among these is, of course, the use of torches in multiple. Next in importance is stack cutting, the practice of piling a number of thin plates into a stack and cutting them as one heavy plate. Stack cutting with multiple torches goes even further, combining the advantages of both techniques. Nesting of workpieces to make one length of cut produce finished faces on two pieces also reduces costs and increases output. The fact that precision flame cutting may often be done to close tolerance so as to eliminate finish machining should also be taken into account in estimating production costs on a shop-wide basis.

When making cost comparisons between a flame-cut part and a similar part made by some other process of fabrication, the estimator should consider not identical designs, but rather the design best suited to each method of fabrication in view of the forces or reactions which must be sustained by the given part.

The breakdown of costs for producing a part by flame cutting will vary with the shape of the part; that is, the relations between its area and the amount of linear cutting involved. A long, narrow part naturally requires more cutting than a square or circular part, and the

This travograph is kept busy working alternately at two cutting stations. Note fresh plate and templet laid out and waiting at rear of machine. Extended tracing and cutting tables enabling this method of operation prove a good investment by reducing setup time to negligible proportions and increasing daily output accordingly. Sometimes more than one machine is mounted on the same pair of tracks to secure even greater flexibility of setup for these cutting operations

Scrap should always be utilized to the fullest possible extent. These two Planographs in a large shop specialize in cutting small shapes from scrap sections left from other cutting operations. The setup here demonstrates again the principle of two-station cutting for rapid production. The machines and their tracing tables are mounted as gantrys spanning the worktable, and are readily moved to wherever fresh plate has been laid out by the plate-handling crew. This crew also removes finished work

proportion of cutting cost to total cost will therefore be greater. The accompanying chart indicates, however, the reasonableness of a frequently used rough formula for approximating aggregate cost by adding the cost of the steel actually utilized to the depreciation loss of the scrap. This approximation is valid for all but thin articles, where the cost of cutting assumes a larger proportion of the total due to the increase in scrap loss attributed to light gage material and extra handling required.

A more exact formula for determining aggregate cost of cutting may be expressed as follows:

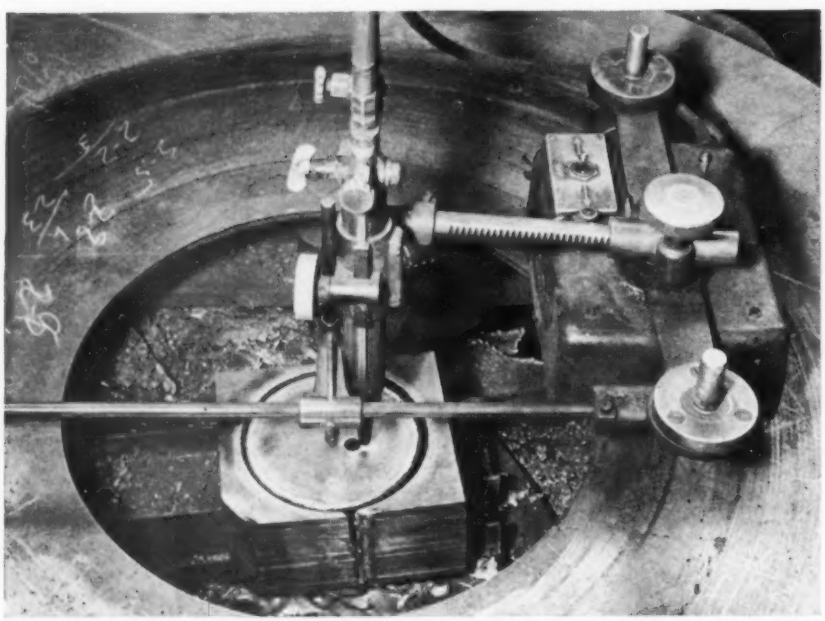
$$C = SA + (S - K)X + ZL$$

in which

- C is the aggregate cost
- S is the unit cost of the steel
- A is the weight of the flame-cut article
- K is the unit salvage value of the scrap
- X is the weight of the scrap produced
- Z is the cost of the oxygen-cutting process per linear foot
- L is the length of the cut contour, in feet.

In this, Z will be a close approximation based chiefly on experience and time and cost studies made on different thicknesses of steel cut in the shop, incorporating gas, labor and overhead costs. Gas cost can readily be calculated from consumption tables, and labor cost can, if necessary, be calculated by considering the operators' productive work factor in relation to the linear footage cut per hour. The latter figure must take into account the number of torches operating simultaneously.

It is evident from the cost analysis in the chart that greatest savings in total cost are to be made in the cost of the steel utilized and in reducing the scrap loss, since these are the major items. Refinements in actual cutting practice, calculated



Another way to increase cutting machine productivity is to clamp plates in a stack and cut all plates at once. These ten plates have been circle-cut by the Radiagraph, and will be cut again on a smaller diameter to form flange rings

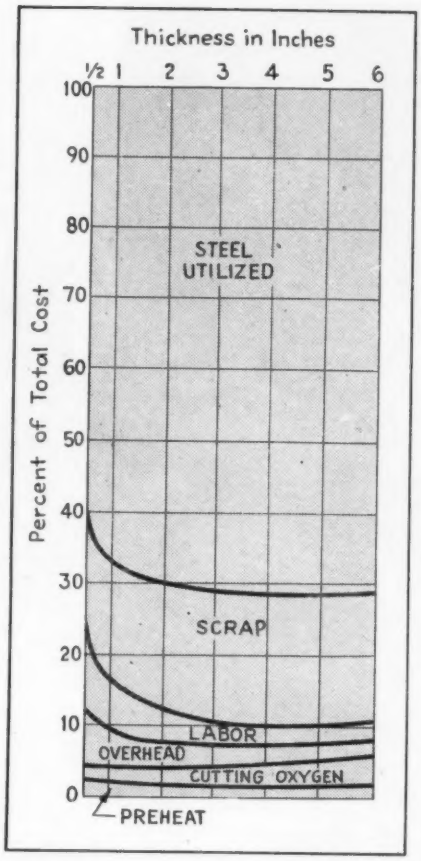
to reduce cost, should be subordinated to these, since cost of cutting represents such a minor fraction of the total. For larger fabrications the steel cost becomes so important that efforts might well be made to design the article to reduce its area and weight. A judicious combination of cutting and welding of different thicknesses or analyses of steel can sometimes accomplish savings in this direction.

Utilizing Scrap Sections

The item of cost termed "scrap depreciation," which is the difference between the original value and the salvage value of the scrap, can and should be reduced by utilizing the scrap sections for the cutting of smaller parts. Despite such efforts, however, a busy shop may produce considerable scrap over and above what can be salvaged in this way, unless production is planned to minimize scrap output. There are two ways to accomplish this.

One possibility is to make a judicious combination of cutting and welding, to produce the required part from a combination of segments welded together rather than by cutting a single piece if the latter method involves large scrap loss. A case in point would be the cutting of a large-diameter ring. Here it would be cheaper to cut several nested segments of the ring with little scrap loss, and join them by welding, rather than to cut a single ring-shaped piece, leaving large scrap sections.

The second possibility is to work out the design of the part with due thought to size and shape of the standard sizes of plate material which must be used, and the consequent possibilities of carrying out successive cutting operations in such a way as to attain the maximum utilization of the material. Often two or more of the same or different parts for an assembly can be nested and cut from a standard size of plate. Also, it will often be found possible to modify the length, shape, or even the general disposition of some projection or contour to permit a higher degree of utility for a standard plate size.

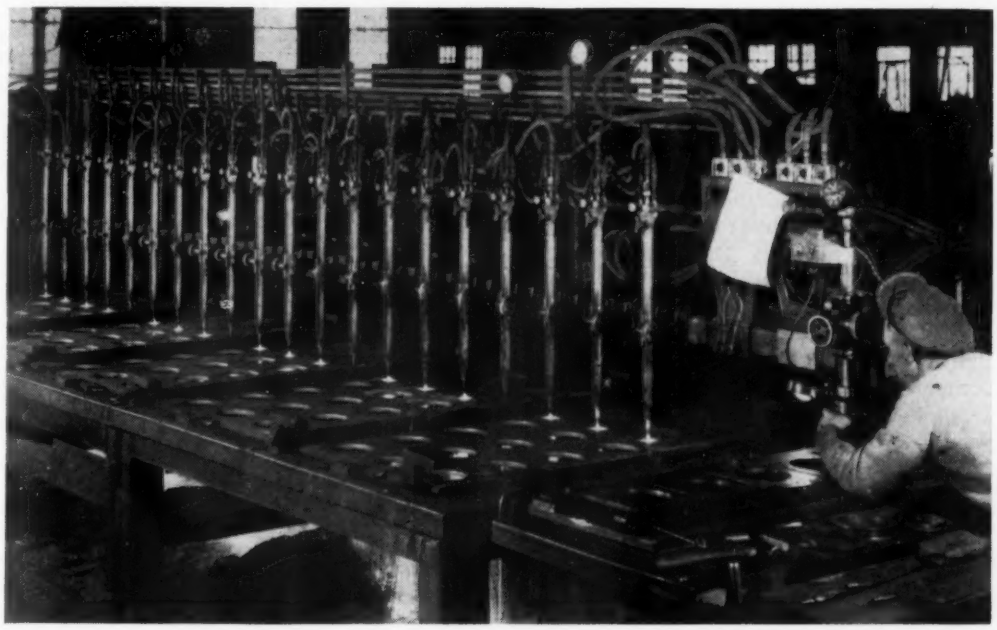


This typical cost analysis for machine gas cutting was compiled from data for cutting 12-inch circles in mild steel. Note that for all but the thinner sections, a rough approximation of the total cost can be obtained by adding the cost of the steel utilized to the loss involved in the scrap. Cutting costs range from 15 to 40 percent of the cost of steel utilized

Labor cost varies considerably but is usually a larger item than the cost of the cutting oxygen, particularly in cutting the lighter thicknesses of steel. The most effective means of reducing the labor cost per finished piece are by increasing the work factor or the productivity of the machine.

The fact that labor and overhead costs increase in proportion to the total on the lighter thicknesses brings with it a temptation to increase the speed of cutting to reduce these relative costs, by using larger tips or higher operating pressures. This procedure tends to increase the oxygen costs, but more important, as stated previously, it seldom accomplishes the desired purpose. Multiple-torch cutting or stack cutting are both far more effective in reducing labor costs in cutting thin plate.

The following installment will be devoted entirely to a discussion of the technique of stack cutting.



Labor cost per finished part is reduced by increasing the productivity of the machine. The simplest way is to multiply the number of torches. This battery of 20 torches on one Oxygraph goes beyond the safe load capacity of the machine, but in this instance rapid production was paramount. Generally ten torches is the practical limit

Insufficient spring pressure resulted in an air cylinder being mounted on the end of the cross-slide to maintain pressure of the stylus against the templet bar. This set-up was satisfactory as long as the lathe was in perfect condition, but difficulties developed when ways and bearings started to wear
WEAR CAUSED DIFFICULTIES

Profile Templet With Air Follower

Floating between a roller and a knife-point stylus, the bar assures increased production and maintains tolerance limits

BY CARL H. WILMOT, MENASCO MANUFACTURING COMPANY

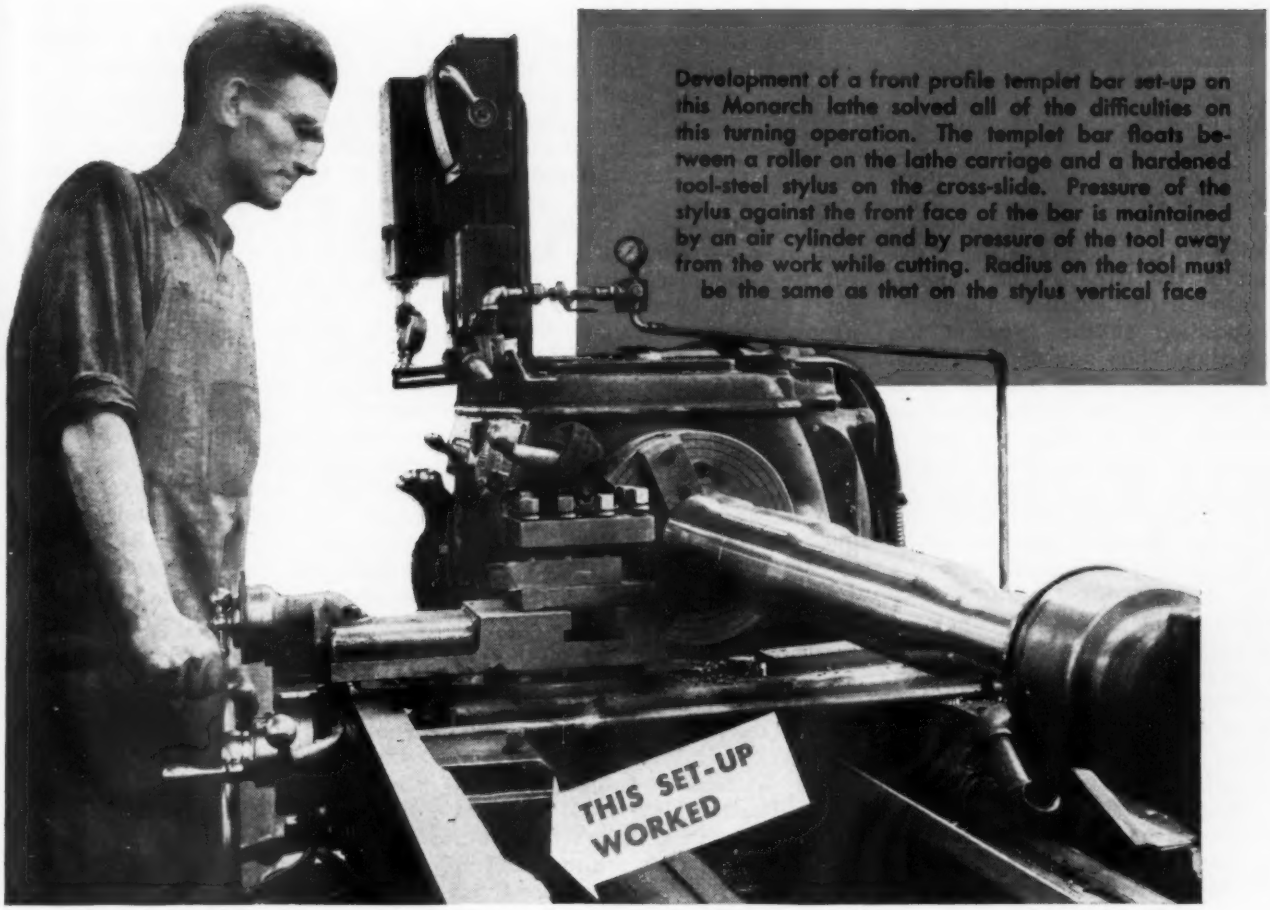
FRONT PROFILE templets for contour-turning main hydraulic cylinders for the landing gear on the Army's P-38 *Lightning* pursuit planes made possible material increases in the production rate at the plant of the Menasco Manufacturing Company. Application of these templets came about through a series of tool developments initiated to overcome machining difficulties.

This cylinder is made from SAE-X4130 seamless steel tubing 5.375 in. in diameter and 48.156 in. long. The tube is rough-bored, centered and faced on both ends, but is not turned when delivered to the lathe for profile-turning. To finish-turn the outside contour of this cylinder in preparation for grinding, it is necessary to machine eleven diameters, nine radii, seven angles and eleven length dimensions. Diameter range from 2.835 to 5.321 in., with three diameters held within 0.003 in., three diameters held within 0.005 in., and five diameters held to plus or minus 0.010 in. Length dimensions range from plus or minus 0.010 in. to plus or minus 0.062 in.

Back in 1941 when the job was started, the profile-turning operation was assigned to a 14-in. Monarch engine lathe and it took a first-class operator a full 8-hr. shift to finish one piece. There was always the possibility of something going wrong, causing the cylinder to be scrapped.

Production requirements increased rapidly and tool engineers were called in. The first step, obviously, was to provide a profile templet for mounting on the lathe taper attachment. Tool designers laid out a four-section tool-steel templet mounted on a baseplate which was in turn mounted on the taper attachment of a new 20-in. Monarch Model M engine lathe. • A special block was mounted on the cross-slide to hold the stylus, a knife-bladed unit held against the templet by several heavy die springs.

With this set-up, the operator was able to jump production to from two to four pieces in an 8-hr. shift. However, no two cylinders would be turned to the same profile. When a



Development of a front profile templet bar set-up on this Monarch lathe solved all of the difficulties on this turning operation. The templet bar floats between a roller on the lathe carriage and a hardened tool-steel stylus on the cross-slide. Pressure of the stylus against the front face of the bar is maintained by an air cylinder and by pressure of the tool away from the work while cutting. Radius on the tool must be the same as that on the stylus vertical face

Whips Tricky Cylinder-Turning Job

heavy cut was taken, tool pressure forced the stylus away from the templet. Increasing spring size was not sufficient to overcome the difficulty, so springs were eliminated in favor of an air cylinder. This kept the stylus against the templet, but still the parts were not turned consistently within tolerances.

The next step was to eliminate the knife-blade stylus, because if the operator did not help it along over some of the radii it had a tendency to stick or bind and the stylus was broken frequently. The templet was redesigned and reworked to permit the use of a round pin running in needle bearings for a stylus. This seemed to overcome all previous difficulties, as piece after piece came off the machine within the required tolerances. To increase production further, it was decided to swedge the tubing, thus eliminating machining time required to remove all of the excess stock. Production was increased to as many as six to eight pieces in an 8-hr. shift.

Two lathes were set up for profiling cylinders and everything went well until these machines started to wear. At first, a toolmaker had to reset the templets about once a week, then it seemed both machines could not be kept running at the same time. Every time an operator changed tools, the templet had to be reset. Finally, it was decided to try out a front profile templet.

Type of Steel Studied

The necessary layout and design was made, but then problems arose concerning the type of steel to be used in the templet. It could not be made in short sections and ground as in the case of the back templet. The front templet had to be machined from one piece and hardened to 62-63 Rockwell C—and as equipment was not on hand for grinding a piece that long, it had to be machined to size before heat-treatment and still be straight after hardening.

A good grade of oil-hardening steel was chosen and worked satisfactorily. However, in making two additional templets, everything seemed to go wrong. When they were tried out, one diameter would be within tolerance limits and the next two would be out. They were finally discarded. The first templet had been warped but not twisted in heat-treatment, and that is why it worked so well. The two that were scrapped were twisted and warped. The next two came up to the correct hardness but were twisted slightly, so a set-up was made on a planer and a Dumore grinder was used to grind their back sides straight. Then they were put on a broach grinder and the front profiles were carefully finished. When these two templets were tried

out on the lathe, every diameter split the tolerance limits.

In using the front profile templet, the width of the templet at any given point governs the position of the tool with respect to the work. The templet bar is supported from either end on brackets clamped to the front way of the lathe, so it floats between a roller set on a vertical shaft at the front of the lathe carriage and a knife-point stylus bolted in a vertical position at the front of the cross-slide. Thus, any slight longitudinal curvature of the templet bar is not reflected in the profile turned on the work. Only when the bar is twisted, changing the effective thickness of the bar and thus affecting the distance between the roller and the stylus, is there any inaccuracy in the turning operation.

As when set up for profile turning with a standard taper attachment, the cross-slide is disengaged so it is free to follow the templet. A 3-in. diameter air cylinder at the rear of the cross-slide maintains pressure against the cross-slide so it is held tightly in contact with the front profile templet bar. The hardened tool-steel stylus has a 1/16-in. nose radius, the same as used on the turning tools. If, some other nose radius is used on the tools, the stylus must be changed accordingly.

Using carbide-tipped tools, production has been stepped to an average of 12 pieces per 8-hr. shift, and it no longer required a first-class operator to handle the job.

Profile-turning of these cylinders is performed with two cuts. The roughing cut is taken at 240 r.p.m. with a feed of 0.026 in. per rev., using a side-cutting tool with a 1/16-in. nose radius. The roughing cut in some places has maximum depth of ½ in. on a side, and it leaves 0.030 in. of material on a side for the finishing cut. The roughing tool has 15-deg. side cutting-edge angle, a 35-deg. end cutting-edge angle, 3-deg. side rake, 0-deg. back rake, 6-deg. relief angles and 8-deg. clearance angles. A 5/32 in. wide and 1/32-in. deep chip-breaker ledge is ground on this tool.

Tool Mounting Saves Time

The V-point finish-turning tool has 60-deg. included point angle and a 1/16-in. nose radius. Relief and clearance angles are 6 and 8 deg., respectively, as for the roughing tool. The chip breaker on this tool is 1/16 in. wide and about 0.020 in. deep. The finishing cut is taken at 400 r.p.m. with a feed of 0.013 in. per rev. Both tools are mounted in a turret holder on the compound rest of the lathe, so little time is lost in changing the set-up between roughing and the finishing cuts.

The success of this application has led to the development of similar front profile-templet applications on several 14- and 16-in. Axelson lathes employed for turning smaller parts. However, in these cases the cross-slide of the lathe is kept connected to its feed screw for transverse adjustment of the tools, and a special compound-slide assembly is mounted in place of the standard compound rest. A special compound base casting is provided to support two heavy die springs, and also to hold the ball-bearing roller which bears against the flat side of the profile templet. The compound slide mounted above this base carries a hardened tool-steel stylus which bears against the front surface of the templet bar under spring pressure. As in the case of the larger 20-in. lathes, the profile templet bar is supported at both ends from brackets, and is free to float between the roller and the stylus.

The major advantage of this design is that the tool pressure combines with the pressure of the air cylinder or the springs to force the slide with its stylus against the templet bar. The pressure of the stylus against the bar thus is not reduced by pressure of the tool away from the work, as was the case in the original set-up when the templet bar was mounted on the taper attachment base.

Felt Plays Polishing Role on Hard Metals

Mounted on flexible shafting and guided by hand, wool felt disks impart high luster to stainless steel

ROCK HARD, durable felt bobs are performing a range of polishing and buffing jobs on tough metals, including airplane engine parts having irregular contours which a plain grinding wheel could not handle evenly. Among the qualities of felt are: can be shaped to fit the surface to be finished; natural abrasiveness of the wool fiber; can be coated with abrasive grains; and its elasticity.

Possibly 85 percent of the felt wheels in use are "set-up," that is, they have been coated with glue or some other adhesive and then rolled in an abrasive of selected fineness. The polishing action is performed largely by the abrasive coating material while the cushioning property of the wheel equalizes the pressure and so provides a uniform cutting action.

Felt polishing wheels are manufactured in several different densities and are operated at speeds of 6,500 to 8,000 linear ft. per min. Generally speaking, the wheels are mounted on an arbor and clamped between adjustable flanges in the same manner as conventional grinding wheels. Thin wheels, however, are often manufactured with in-built metal flanges to impart lateral stiffness. Among special types is one composed of radial segments of sheet felt assembled between metal locking rings.

Felt polishing wheels of every description are fabricated from wool. The material is manufactured by extensive fulling—a mechanical process of kneading wool under special conditions of low heat, pressure, moisture and lubrication. This process, which is peculiar to the manufacture of felt, produces a fine-grained fibrous structure of remarkable hardness and strength, without requiring chemical change in the wool fibers and without the use of binders of any sort to act as a stiffener.

THE GERMAN ECONOMIC PEACE HARD, SOFT... or WORKABLE?

IT is not surprising that difficulties are being encountered in spelling out the detailed terms of the German economic settlement.

The problem is exceedingly complex. The German economy is more or less inextricably bound up with the economy of continental Europe. Before the war that area —excluding the United Kingdom, Ireland and Russia— accounted for approximately one-fourth of the world's production, and for more than thirty-five per cent of world import and export trade. Germany's production constituted almost one-third of the output of continental Europe. It is obvious that the decisions we make now concerning the future German economy will exert profound influence not only upon the economy of Europe but also upon that of the world. It is clearly not practicable to plan for an expanding world economy unless provision is made for Europe generally to share in the development.

Despite the magnitude and complexity of the problems involved, it is crucial that we and our Allies come to swift and decisive agreement. Such agreement is important both to world economic reconstruction, and as a demonstration that those who won the war can reach accord on the terms of world economic rehabilitation.

We shall accomplish little if we continue to debate in terms of *adjectives*. Yet most of the public discussion to date has centered around whether or not the economic settlement with Germany should be *hard* or *soft*. To make progress we must focus instead upon *objectives*. A good program is one that will promote our objectives—a bad program is one that will not.

What Are We Trying To Accomplish?

Upon the economic objectives of the German peace settlement there is little fundamental debate. This is demonstrated by reference to a number of documents of recent release—the United States Directive to General Eisenhower of April 1945, the Report of the Tripartite Conference at Berlin of July, the Report of the American Advisors to the Office of Military Government of September. The latter document stresses fundamental difficulties in developing a practical program for carrying out the objectives of the other two, but it does not question their formulation of aims.

What are the objectives that we are seeking to forward:

1. The disarmament of Germany.

2. The elimination of German industries devoted primarily to armament production.

3. The assessment of reparations to compensate those nations which have suffered losses from German aggression through direct war destruction and through the German policy of confiscating industrial equipment to her own use.

How Far Are We Agreed on Procedure?

There is also a wide measure of agreement upon detailed procedure for carrying out these objectives. No one, of course, questions the policy of confiscating German arms. Equally, there is agreement that German industry devoted directly to the production of war equipment should be confiscated or destroyed, and that control measures should be instituted and sustained to prevent her from reconstituting such industries in the future. Since it is not practicable to prevent aircraft production and shipbuilding from being diverted to military use, these industries are included in the armament category. And similar reasoning generally extends the list of prohibited industries to ball bearings and abrasives.

There is an additional category of German production which all of the Allied powers agree should be uprooted and permanently barred. It embraces all economic activity which prewar Germany cultivated on an uneconomic basis through subsidy and other protection for the prime purpose of developing a self-sustaining economy to support aggressive war.

The major elements in this category are not difficult to define. A great German industry for the synthetic production of gasoline and other oil products from coal never operated upon an economic basis. The cost of such fuel products to prewar Germany averaged almost four times what it would have cost her to buy petroleum products in the world market. It is doubtful whether these plants could be operated postwar at a cost much below three times the world market price for competing petroleum products.

A similar situation applies to German synthetic rubber production. In an attempt to free herself at least partially from dependence upon supply lines, she produced synthetic rubber at a cost at least double the world market purchase price. Similarly, she protected or otherwise subsidized a considerable agricultural production, particularly in grains, for which her lands were so ill suited that Germans had to pay for German-grown wheat from three to four times the world market price.

These are merely outstanding examples. The maintenance of such activities in Germany constituted a drain upon the German economy rather than an advantage other than that of preserving a self-sufficiency necessary for war. Hence their elimination is clearly indicated, and generally subscribed to, though the job of defining a complete list is far from easy.

What Is The Area of Dispute?

Unfortunately, this total catalogue of agreed-upon measures is not sufficient to provide either adequate security against a resurgence of German militarism or satisfactory restitution to her European neighbors for Germany's ruthless destruction of their industrial plant and equipment. To serve these two ends it is necessary to cut down the margin of German dominance in heavy industry—in steel, in electric power, in machine tools, and other industrial equipment. Unless such steps are taken, Germany will emerge from the war with sufficient industrial power to provide a continuing and perhaps uncontrollable military threat; and we should be perpetuating a dominance that was developed, as a matter of German strategy, far beyond the requirements of her civilian domestic markets or the export potentials of normal trade.

German steel capacity was built to a wartime peak of twenty-four million tons a year. Before the war she had accumulated a store of machine tools greater than that of the United States, and her present stock of some four or five million tons of such tools is second only to ours. There is little debate over the necessity and justice of cutting down the margin of German dominance in heavy industry, particularly since it was built to its current levels through aggressive economic warfare to serve as an instrument of actual warfare. It is recognized, too, that in this sector of the German economy will be found the most useful reparations in kind for the countries damaged by German aggression.

The question is how much heavy industry and electric power equipment should be taken from Germany and transferred to others. The Russians, having experienced colossal war damage, are demanding very severe assessments. They talk of reducing postwar German steel capacity to three million tons annually.

The United States inclines to assessments in this field of less extreme dimension—we have suggested leaving in Germany an annual steel capacity of from seven to ten million tons. We naturally are concerned lest action be taken that will cause a complete breakdown of the German economy. If this should happen while we maintain occupational forces there, we should feel responsible for seeing that the Germans within our jurisdiction are provided with at least the means for subsistence. Furthermore, both we and the British know that in the long run our peoples will not support control measures over Germany which go beyond our concepts of reasonable fairness consistent with security requirements.

It is no part of our intention, as has been suggested by some, to provide for a German economy that will serve as a buffer against Russian expansion. We know, however, that our weakest course would be to commit ourselves now to continuing control measures which our people would later repudiate as falling outside democratic concepts of justice. On this issue we cannot, and should not, compromise.

How Can We Resolve Our Differences?

The best chance for resolving the differences which have appeared between the Russian position on the one hand and the American and the British position on the other lies in making a sharper distinction than has appeared in current discussion between long-term and short-term control decisions. All of us are agreed upon the policy of wiping out German military production and that part of German economic activity which has been run at economic loss to provide for a national self-sufficiency useful only for war purposes. But we are unwilling to enter into long-term commitments for holding down those parts of the German economy that do not constitute a war threat. That would unduly penalize future generations of Germans and drag down the whole economy of continental Europe.

It should be possible to reach agreement that measures for cutting down German heavy industries and power-generating facilities are immediate measures, and that no attempt will be made to sustain such controls over an extended period. If part of the German establishment in these fields is transferred to countries whose manufacturing resources have been damaged by German aggression, it can serve the purpose of effecting a reasonable balance without destroying utterly incentives for a new generation of Germans to improve by peaceful methods their status in a peacetime world.

Such a program is consistent with the concept of building a healthy and balanced European economy in which general economic interdependence provides one of the essential safeguards against a resurgence of German militarism. We must still face the problem of agreeing upon how far the non-armament segments of German industry can be cut back at the present juncture without leading to disastrous breakdown with its resultant chaos. Such definition, though formidably difficult, should not be beyond the capacities of the nations whose combined might brought victory, and who have the strongest of incentives for devising a lasting peace.

The key to agreement lies in each of us doing his best to understand the position of the other. Russia must recognize that we cannot get our people to subscribe to the permanent repression of a European economy which would deny to millions of people any hope of normal economic betterment. We should try to understand Russia's conviction that she is entitled immediately to reimburse herself for her war losses by drawing upon the German industrial establishment that still exists. It will help to resolve our differences if we separate in our thinking steps that require permanent controls from those which are merely temporary expedients.

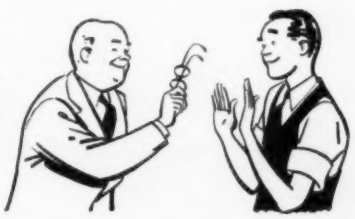
Neither of us will be forwarding our ultimate and common objectives if we impose controls that blight the development of so large and important a segment of the world as continental Europe. In such a blight lies the germ of a Third World War.

President, McGraw-Hill Publishing Co., Inc.

THIS IS THE 41ST OF A SERIES

FOREMAN'S ROUND TABLE

Job Evaluation for Foremen?



"YOU KNOW, ED," said Al one noon, "I just caught myself in a mistake I'd have fired anybody else for. I gave out an old blueprint with a new job and didn't find out the parts were wrong until a day's work had been wasted."

"Maybe you need glasses, Al. You ain't as young as you used to be, but you sure hate to admit it. They'd better hurry up with that retirement plan for shop foremen!"

"Listen, Grandpa, I'll be shifted to some old man's job like toolroom foreman about the time you're pushing up daisies. I can still hold down a job that takes walking around a shop floor, but I hear your boys don't get any help from you unless they can carry the job to your desk."

"Well, at least I haven't sent out any bum tools recently, Al, and I ain't goin' to!"

"Mebbe so, but we all make mistakes, Ed. My bull set me to thinking that when one of my boys makes a mistake, the cost is a few dollars; when I make one, it's about ten times as much; and when the Supe makes one, it's about ten times as expensive again. If the Old Man makes one on that basis, we all will be out of jobs. Maybe that's why a boss gets paid more—he's supposed to make fewer mistakes."

"You sound like that efficiency engineer that put in that new-fangled system he called 'job evaluation.' It looked then, and still does, like a way to save a dumb foreman a lot of thinking and trouble."

"I dunno, Ed, the system has proved darn practical as far as I'm concerned. In fact, I think there ought to be some way like that to grade us foremen. Then maybe I'd get paid what I'm worth, instead of less than you get."

"Al, you couldn't live on what you're worth, so you'd better be happy with what you get. Besides, if you want a raise, all you have to do is to go across the street and get Empire Tool to offer you a job for more dough, then announce you plan to leave. That's been worked here before by Jack Benson, if I remember right."

"Yeah. Brown Chain offered him a big raise. The Old Man offered him more, so he stayed. He's still here, but not where he belongs—in our screw-machine department. When he got more dough, the Old Man figured he'd have to give him a better job or the rest of us would be sore. So he made him assistant super. The Old Man beat Brown on a steal, but we got stuck with a screw-machine foreman in the wrong job."

"Benson *has* caused so much trouble the Old Man has either got to fire the guy or kick him back downstairs, but what's your point, Al? You gonna figure out a way to get Benson back on the screw machines, or to keep the Old Man from hating Brown?"

"I don't think I can do either one, to tell the truth, Ed. But I do think there ought to be some way of evaluating our jobs just like we do the men's. Then we wouldn't get into a mess like I did with my assistant, Bill Jenks. Empire offered him double what he was getting here. When the Old Man let me offer him the same amount to stay, he turned me down cold. Said if he was worth that much to us, why did he have to get a job outside before we'd pay him that much, and how come it took a year of nagging to get a ten-dollar raise last Christmas."

***WHAT DO YOU THINK** about job evaluation for management? Is it possible to work out factors for non-productive jobs? Does better work, or a good outside offer, mean most in getting ahead? What happens when one foreman gets a raise by "squeeze," while others do not? Your ideas on this subject will help solve a confusing problem. Published letters will be paid for.*

Extrusions Drilled From End-to-End In Box-Type Stripping Jigs

BY CONRAD MATTSON, BOEING AIRCRAFT COMPANY

Various aluminum-alloy extruded shapes are drilled and, if necessary, reamed or tapped in strip form before the individual parts are cut off. Open-end jigs permit strip drilling of any required length of extruded shapes. Lever-operated stop pins accurately locate the extrusion

Center support plates are used to guard against distortion in drilling wide extruded shapes. Special feed and clamp device is attached to cut-off saw unit

STIFFENER ATTACHMENTS and many other parts of the Boeing B-29 *Superfortress* bomber and other aircraft are made from extruded 24ST aluminum alloy shapes which are cut to length and then machined. Tool and production engineers at the Seattle plant of Boeing Aircraft Company have materially increased the production of these parts without adding to the available production equipment by arranging to perform as many operations as possible before the parts are cut from the extruded lengths.

An important phase of this development has been the design and use of strip-drilling jigs on Natco multiple-spindle drilling machines. These jigs have lever-operated stop pins which permit drilling a section of the extruded shape, then moving it along in the jig a predetermined distance so the next section can be drilled in the same setup. Thus, extrusions ranging from 4 to 15 ft. in length can be drilled from end to end before they are removed from the jig.

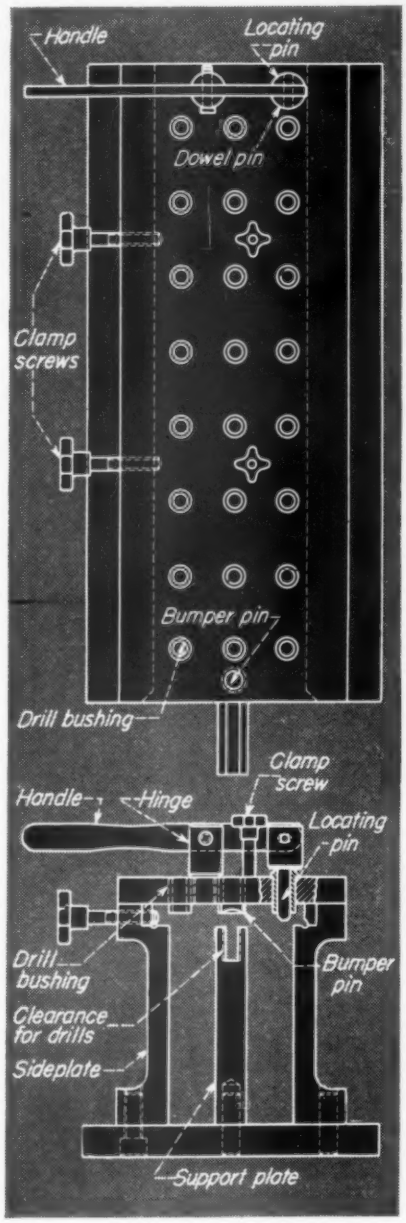
Essentially, these strip jigs are box-type, with two open ends and with the coverplates bolted in position. The work is inserted in one end and feeds out the other end as it advances through the jig. The extruded shape is supported on guide rails machined in the sideplates of the jig.

For wide extrusions, center support plates frequently are used to guard against distortion during the drilling operation. These support plates usually are bolted and dowelled on the baseplate, as shown in the accompanying sketch, and are ground, after assembly, to a height which is 0.005-0.010 in. lower than the guide and support rails in the sideplates. Usually the support plate extends 2 in. or more in front of the bushing plate to permit its use as a support when entering an extrusion in the jig. The sideplates also can be extended for this purpose.

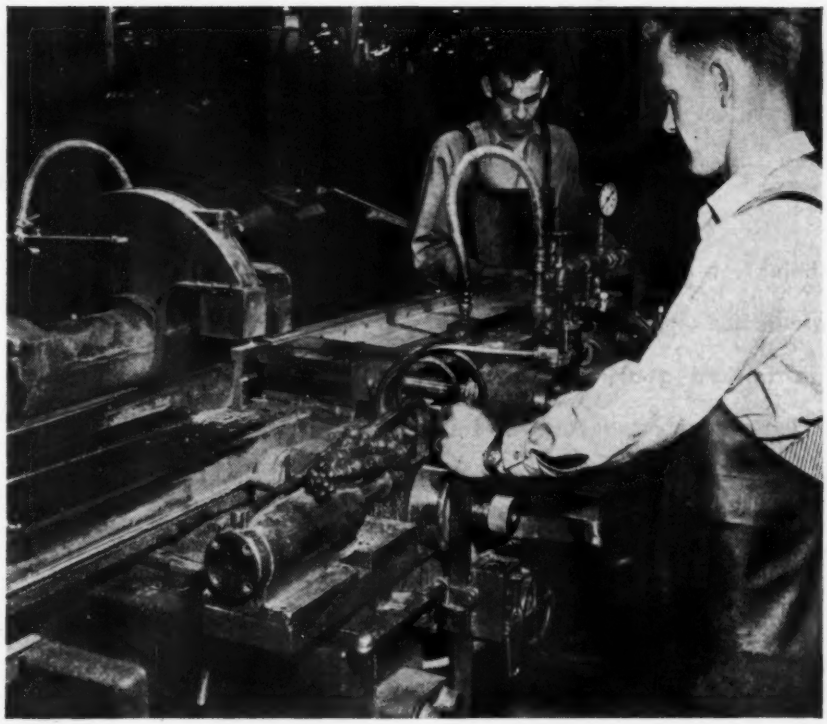
To insure against bumping and damaging the drill bushings which extend below the bushing plate, a bumper is located in the forward end of the bushing plate so that an extrusion entered in such a way as to strike the drill bushings will first contact this bumper pin and thus be forced down sufficiently to clear the bushings. The sketch shows a jig for drilling 24 holes at the same time in an aluminum alloy extrusion. Other combinations easily can be arranged by changing the design of the bushing plate.

When center distances are too small to permit drilling adjacent holes at the same time, two jigs frequently are used to drill alternate holes. When this is done, two locating pins usually are employed in the second jig, so as to insure alignment of the holes drilled in the second operation with those drilled during the first operation. Clamp screws in the bushing plate and in one of the sideplates assure alignment of the extrusion with the guide rails.

In the jig shown, the baseplate, sideplates, bushing plate, locating pins, handles, hinges, bumper pins and support plates are made of low-carbon cold-rolled steel. The drill bushings and pin guide bushings are of hardened tool steel made according to A.S.A. standards. Each of the sideplates and the support plate are mounted on the baseplate with three ½-in. socket-head cap screws, and two ½-in. dowel pins. Likewise, the bushing plate is connected to each of the two sideplates with three ½-in. socket-head cap screws and two ½-in dowel pins.



This strip-drilling jig is designed for drilling 24 holes, each 21/64 in. in diameter, in an extruded aluminum alloy section



Automatic air-operated clamping and feeding units on this Cochrane-Bly automatic cut-off saw make it an easy matter to cut individual stiffener attachments from predrilled extruded lengths

The 0.325-in. diameter locating pin has a 1-in. diameter and 1¾-in. long head slotted for connection with the lifting handle. The hole in the handle for the pin connection to the locating pin is slotted so the pin is lifted vertically in its guide bushing. This locating pin has a spherical point for easy entering into drilled holes in the workpiece and the point is carburized, hardened, ground and polished.

Extrusions Cut to Length

When the extruded lengths have been drilled, and reamed or tapped if necessary, the extrusions are transferred to a large Cochrane-Bly automatic cut-off saw equipped with a special Boeing-designed pneumatic clamp and feed unit. In this machine, the individual attachment units are cut from the extruded lengths by feeding the extrusion a predetermined amount after each cut is made. The long extrusions are easier to handle than the individual pieces cut from them and this is a major factor in reducing the time for drilling the attachments. Steel shapes and other materials can be drilled in the same manner as these aluminum-alloy extrusions and it is to be expected that the strip-drilling procedure will be applied to other products which can be handled in a similar manner.

Save Taxpayers' Money

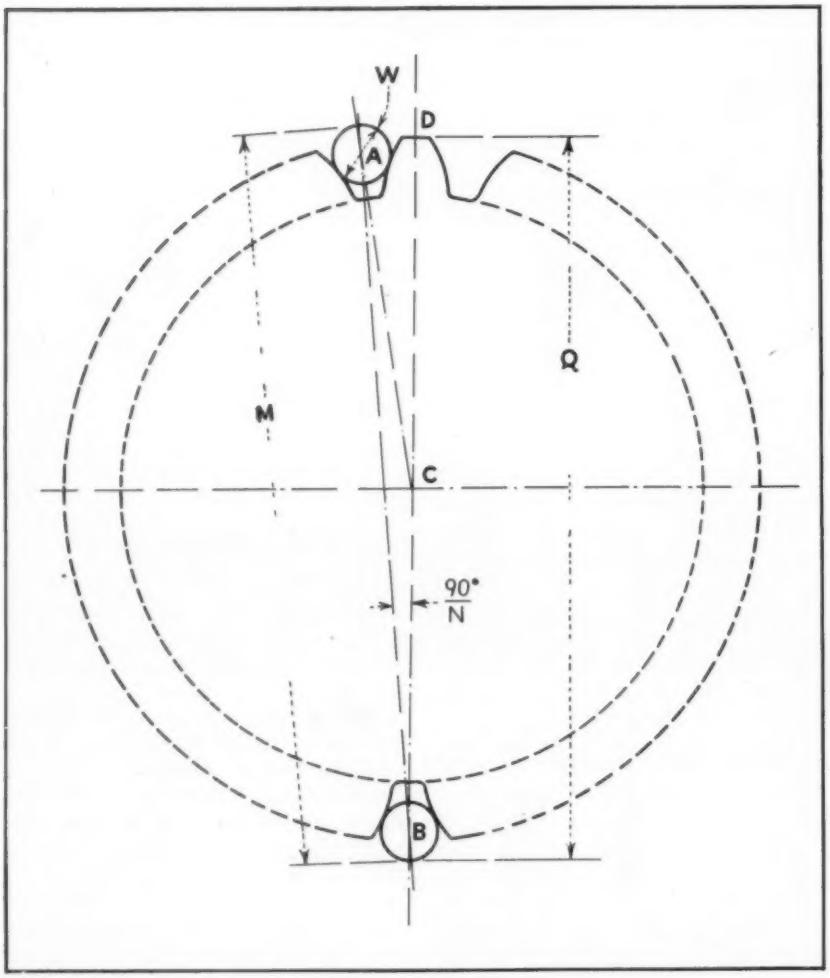
MANY SHOPS are now clearing out termination-surplus materials and equipment. One small angle is the cost of handling at later steps if the job is done in a sloppy manner. For example, take odd lots of steel—say 1000 lb. to 5 tons. In one case, 15,000 odd pieces were merely thrown into a car by the shipper. At a government warehouse, it took six men and equipment two days to clean out the car. If the steel had been bundled in lots, two men could have handled the 15 bundles in about 2½ hr. As it was, the shipper made it plain later that he didn't care whether the taxpayers are charged the difference because of his neglect.

Correction Factors Simplify Odd-Tooth Gear Measurements

Elimination of measurement and calculation errors in measuring odd-toothed gear diameters is an important advantage of this method of applying corrections

IT IS OFTEN necessary to determine the actual outside diameter of a spur gear which has an odd number of teeth. As the measurement cannot be made directly with micrometers, various cumbersome means involving considerable equipment are used, or recourse made to elaborate computations based on corner-to-corner measurements.

However, the method given here involves only the simplest of computations and requires nothing more than a micrometer and two gear-measuring pins of any convenient size. The pins should contact the sides of the teeth and at the same time project beyond the outside diameter of the gear. Here are shown the two measurements which it is necessary to make. *M* is a measurement over the pins located in spaces as nearly diametrically opposite as possible. *Q* is a measurement from one of these pins to the top of the opposite tooth. *W* is the diameter of the pin.



Calculations are based on the result of measurement M. Measuring more than one span and obtaining an average assures accurate results

Values of k for various numbers of teeth

Number of Teeth	k
5	0.0515
7	0.0257
9	0.0154
11	0.0103
13	0.0073
15	0.0055
17	0.0043
19	0.0034
21	0.0028
23	0.0023
25	0.0020
27	0.0017
29	0.0015
31	0.0013
33	0.0011
35	0.0010
37	0.0009
39	0.0008
41 to 43	0.0007
45 to 47	0.0006
49 to 51	0.0005
53 to 59	0.0004
61 to 69	0.0003
71 to 91	0.0002
93 to 157	0.0001

The outside diameter is then computed from the following:

1. *Outside dia.* $= 2Q - M -$ *Correction*
2. *Correction* $= k(M - W)$
3. k is obtained from Table I and depends on the number of teeth in the gear.

Example: 15-tooth pinion. Two measurements with micrometers are taken: *Q* and *M*. 0.200-dia. pins are used.

$$
\begin{aligned}
&2.236 = M \text{ (to 3 places)}\\
-\ &0.200 = W\\
&\overline{2.036} = M - W\\
\times\ &0.0055 = k \text{ (Table I)}\\
&\overline{0.0112} = \textit{Correction}\\
&2.2171 = Q\\
\times\ &\quad 2\\
&\overline{4.4342} = 2Q\\
-\ &2.2360 = M\\
&\overline{2.1982} = 2Q - M\\
-\ &0.0112 = \textit{Correction}\\
&2.1870 = \textit{Outside diameter}
\end{aligned}
$$

If a number of gears of the same design are being measured, the same value for the correction may be used on each gear, in almost all cases, with little error. If, on a lot of eleven-tooth pinions, for example, the M measurements are all within 0.010 of the measurement used in computing the correction, the maximum possible error introduced in outside diameter reading will be only 0.0001 in. A smaller error will be found with gears of greater numbers of teeth. On gears of less than eleven teeth, a larger possible error may be introduced which may be as high as 0.0005 in. on a five-tooth pinion under the same conditions as described for the eleven-tooth pinion above. When doubt exists as to how much range can be covered without recomputing the correction factor, the factor should be computed in each case. Another possible source of error in the outside diameter reading is in the spacing error of the teeth. This can be compensated for almost completely by substituting $Q' + Q$ for $2Q$ in the outside diameter formula. Q' is the same measurement as Q except that it is taken from the opposite pin.

This method of determining outside diameters may also be applied in determining the inside diameter of internal gears by using the following formulas:

1. *Inside dia.* $= 2Q - M -$ *Correction*
2. *Correction* $= k(M - W)$
3. k is obtained from Table I.

Derivation of formulas for measuring external gears:

1. Angle $ABD = \dfrac{90 \text{ deg.}}{N}$

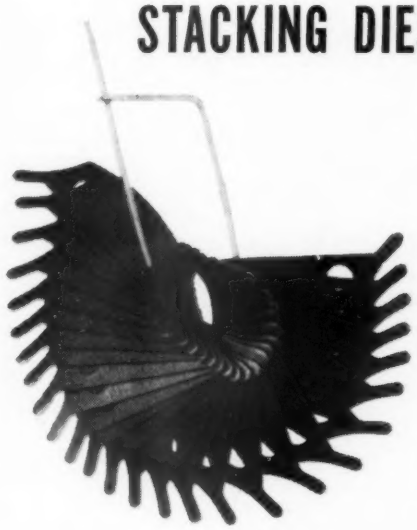
   Where N = number of teeth
2. $AB = M - W$
3. $CB = \dfrac{AB/2}{\cos (90/N)} = \dfrac{(M - W)/2}{\cos (90/N)}$
4. $DB = Q - \dfrac{W}{2}$
5. $DC = DB - CB$

   $= Q - \dfrac{W}{2} - \dfrac{(M - W)/2}{\cos (90/N)}$
6. *Outside Dia.* $= 2DC$
7. $O.D. = 2Q - W - \dfrac{(M - W)/2}{\cos (90/N)}$
8. $\dfrac{1}{\cos (90/N)} = 1 + k$

   (for any given number of teeth in Table I)
9. $O.D. = 2Q - W - kM + W + kW$

   $= 2Q - M - k(M - W)$
10. *Correction* $= k(M - W)$
11. $O.D. = 2Q - M -$ *Correction*

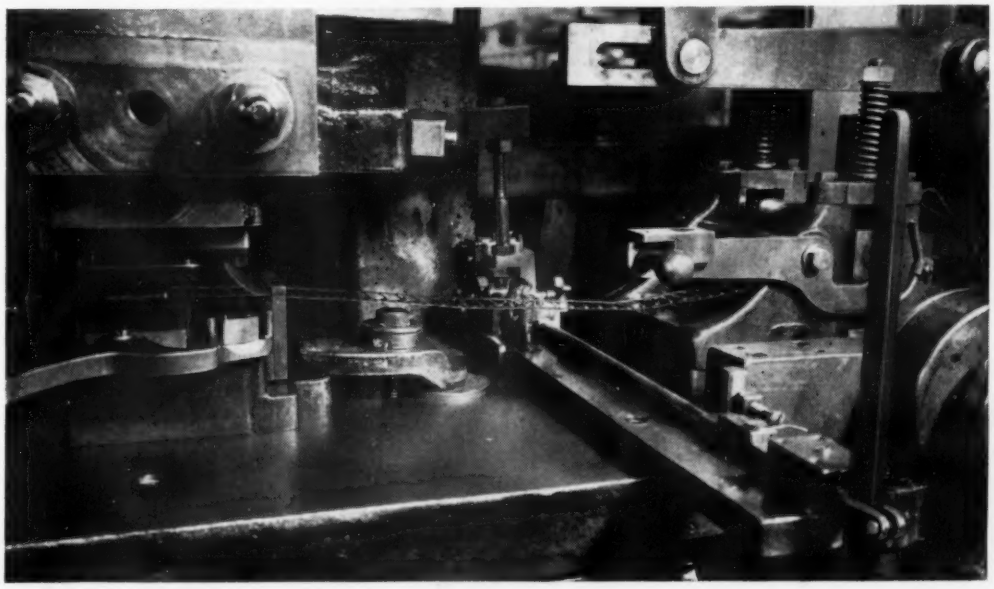
STACKING DIES Count Laminations Automatically



MAGNETIC CIRCUITS in magnetos involve the use of laminations that are fastened by rivets after stacking a certain number in a group prior to using the stack as an insert cast into the housing. To avoid counting out laminations for each stack at Bendix-Scintilla, stacking dies are used on presses that do the blanking from steel ribbon, which is fed through in the usual way.

Each press is equipped with a cam automatic throwout mechanism that stops the press momentarily so a completed stack can be removed by hand. After starting the press again, the operator uses a special safety pin to keep the removed laminations together as a group until such time as they are subjected to riveting operations.

The automatic cam mechanism, part of which can be seen to the right of the press bed in the illustration, includes a ratchet wheel arranged to advance one notch at each down stroke of the punch. The cam is set to disengage after the ratchet wheel has turned any given number of notches, that is, after the die has cut the required number of laminations to form a stack.

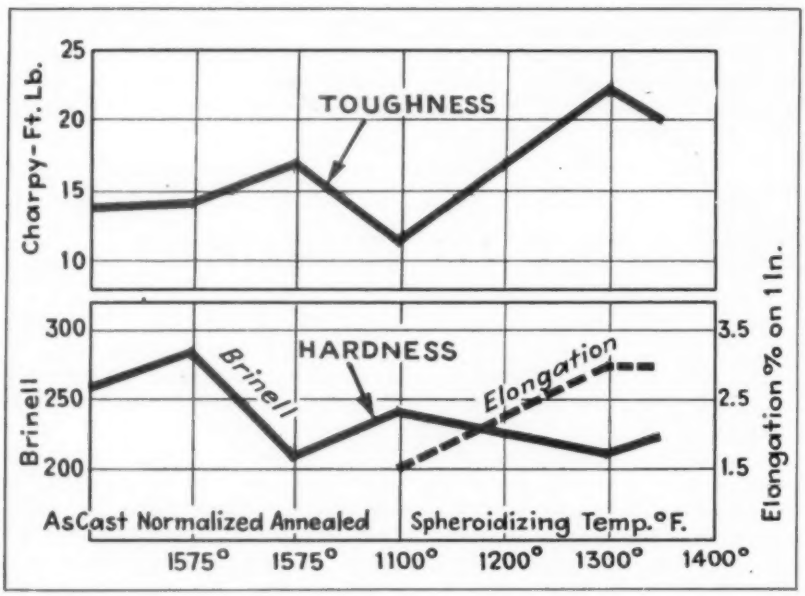


Laminations blanked from steel ribbon are grouped automatically by a die attached to the press. The operator removes the stack, pins it together (above) to hold the group for riveting. Stacks of laminations are cast into the housings of magnetos

How Heat-Treatment Affects High-Strength Irons— II

BY DR. C. R. AUSTIN, ASSISTANT TO THE PRESIDENT, MEEHANITE METAL CORPORATION

Studies of spheroidization show how the physical properties of irons in the as-cast condition can be changed by annealing



Toughness vs. Hardness. This chart symbolizes the relationship of hardness to toughness when Type GA Meehanite is normalized, annealed or spheroidized at various temperatures for 5-hr. periods. If any treatment produces an increase of toughness, a loss in hardness results, and vice versa

IN A PREVIOUS article, five methods were given for altering the physical properties of cast irons by means of heat-treatment. These processes were stress relieving, annealing to assist machinability, quenching for hardness, interrupted quenching, and Martempering. Recently compiled data on long-cycle annealing and flame hardening conclude the subject.

6 Spheroidizing

By prolonged heating at a temperature below the critical point, the structure of irons and steels can be altered so carbide constituents have a globular form. This process, known as spheroidizing, is applied to steels to make them more machinable; in the case of irons, it is used to decrease the hardness or to increase the toughness, provided that a loss in strength is permissible.

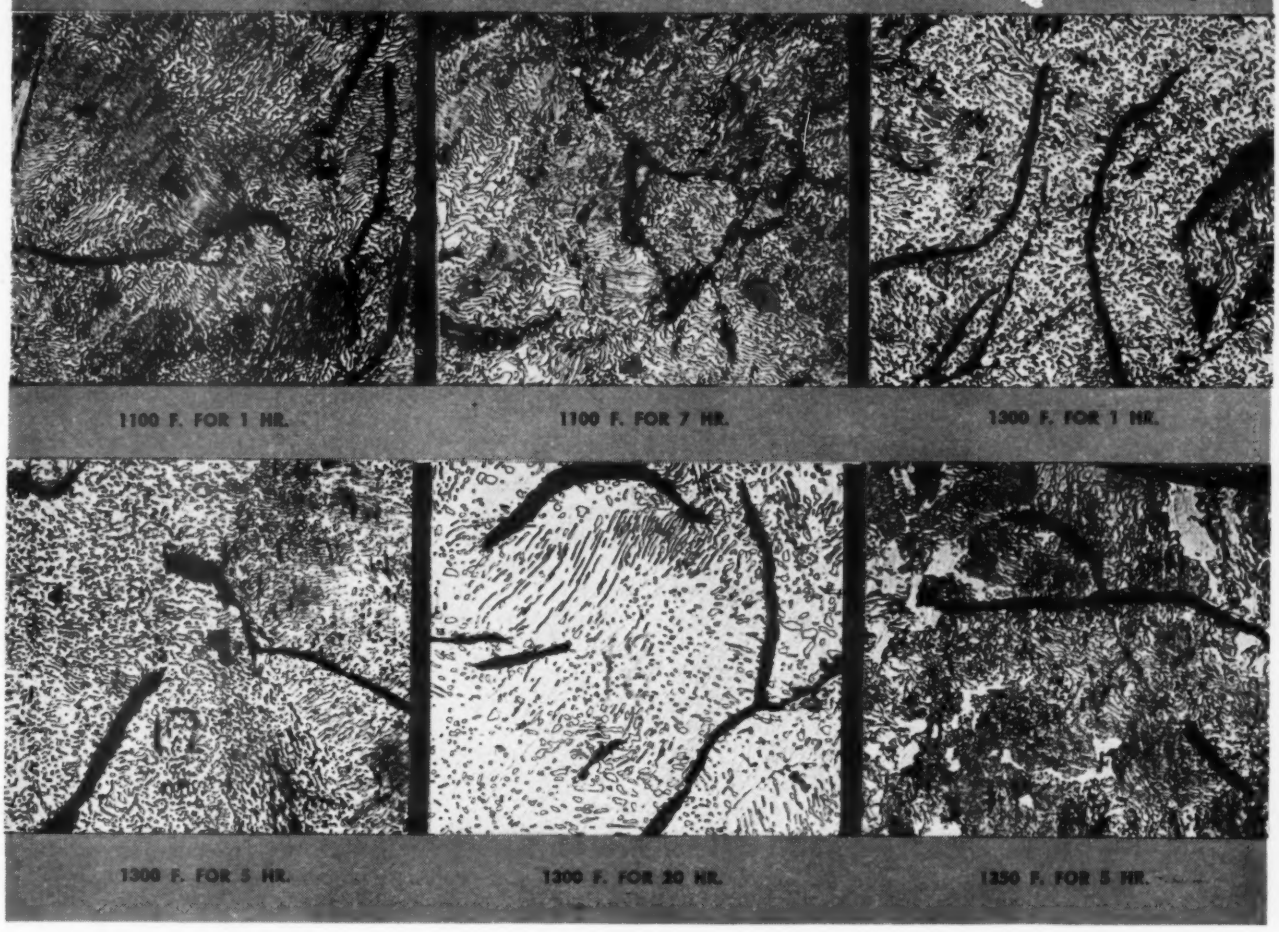
To determine the effect of spheroidizing upon the high-strength cast irons, experiments were carried out upon cast test bars, which with one exception possessed the pearlitic structure of the "as cast" condition, as illustrated in a previous article. The above-mentioned

PHYSICAL PROPERTIES OF SPHEROIDIZED TYPE GA MEEHANITE

ANNEALING TREATMENT	COOLING METHOD	CHARPY TEST BAR		TENSION TEST BAR		
		Impact Strength Ft.-lb.	Brinell Hardness	P.S.I.	Brinell Hardness	Elongation % in 1 in.
As cast	....	14.5	255	58,800	255	....
Normalized, 1575 F.	Air	14.7	285	57,400	269	....
Annealed, 1575 F.	Furnace	17	207	....	....	....
1 hr., 1100 F.	100 F./hr. to 700 F.	11-15	274	54,000	241-269	1.5
7 hr., 1100 F.		11	245	55,200	248	1.5
1 hr., 1300 F.	100 F./hr. to 700 F.	18.5	223	48,600	195	2.
5 hr., 1300 F.	Air	22-18	215	48,800	188	3.
20 hr., 1300 F.	Air	23-16	200	42,400	162	2.5
*50 hr., 1300 F.	Air	18	150	40,600	140	....
5 hr., 1350 F.	Air	20	224	55,450	202	3.

*These test bars were machined, oil quenched from 1575 F. and then spheroidized. All other tests were spheroidized as cast.

EFFECTIVE SPHEROIDIZATION of Type GA Meehanite depends upon selection of the proper annealing temperature and allowance of sufficient time for the process to progress to the desired point. A temperature of 1100 F. produced little effect; 1300 F. caused a pronounced increase in toughness and a drop in tensile strength and hardness with time at heat. Separation of free ferrite and some tendency toward spheroidization of the pearlite occurred upon heating to 1350 F. for five hours.



exception was a test conducted for 50 hr. at 1300 F. upon duplicate test bars previously oil-quenched from 1575 F. These subcritical treatments were performed in a vacuum to eliminate the scaling and decarburization that usually occur from annealing for several hours.

As shown by the accompanying photomicrographs, annealing at 1100 F. for periods of 1 hr. and 7 hr. has little effect upon the cast structure. When a temperature of 1300 F. is used, the progress of spheroidization is clearly revealed as the time at heat is increased. A definite loss in tensile strength occurs without a comparable gain in ductility. The chief result of holding the material at 1350 F. for 5 hr. appears to be a separation of a moderate amount of free ferrite and some tendency toward spheroidization of pearlite.

Physical tests upon test bars indicate the effects of spheroidization treatments upon hardness, impact strength and tensile strength. Treatment of cast test bars at 1100 F. for periods of 1 and 7 hr. resulted in a slight decrease in toughness, but little change in tensile strength. Samples annealed at 1300 F. showed a rise in Charpy values with time at temperature, but the hardness and tensile strength fell.

Samples that were quenched prior to spheroidizing for 50 hr. at 1300 F. exhibited the anticipated drop in hardness (to 150 Brinell) and loss in tensile strength (down to 40,000 p.s.i.). This behavior was not accompanied by a proportionate increase in ductility.

7 Flame-Hardening

Castings may be hardened on the surface locally by torch heating, and cooling rapidly with a suitable quenching medium (usually water) immediately after heating. The zone of maximum surface hardness obtained with flame-hardening is usually one-half to three-quarters of the total depth of the case and is file hard. Points to be remembered about castings for flame-hardening are:

(a) Extra foundry stock is desirable on light castings to take care of warpage and cleanup.

(b) Holes cause difficulty and should be countersunk. The distance between the edge of the castings and the holes should always be over ¼ in.

(c) Avoid designs which involve sudden changes of heavy to light sections. Use fillets generously.

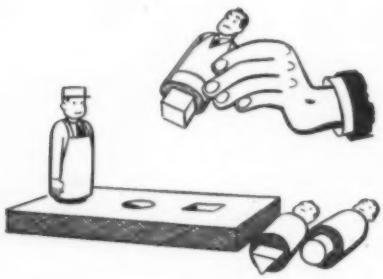
(d) Specify whether full hardness is necessary at the extreme ends of the hardened surface.

(e) Wall sections and ribs adjoin a hardened surface should not be less than ½ in. thick.

TALKING SHOP

Blued and Unblued

ONE OF OUR FRIENDS was a shift foreman in an arsenal just before the war. Three shifts were working around the clock, scraping in worms to drive gear sectors in gun mounts. Two weeks at work left the job about as poorly fitted as it was originally. Finally, the foreman in charge of the first shift got hold of the foreman in charge of the second and said, "How do you scrape a gear?" It turned out that both used the same method; namely, bluing the worm, turning it a few times, and then scraping at the spots where the bluing had been worn away. But when they checked with the foreman of the third shift, they found that he scraped at the spots *where the bluing remained.* The result, of course, was that he returned the worm each night to as bad a condition as it was when the other two shifts started in the morn.



Changing Times

THESE ARE DAYS reminiscent of the end of the last war and the beginning of the Great Depression, a time when the butcher rediscovers courtesy and there seems some hope of replacing that perforated spare tire. It is also the time when many men are available, a time of opportunity to improve and strengthen a postwar organization; but a time, also, in which we must be extremely careful not to replace or supplement thoroughly dependable people with others who made an "excellent" record *under wartime conditions.* The whole situation reminds us of the story of the supervisor who said to a foreman, "You know, young Blank is a darn good man." The foreman's reply bears considerable study. He said, "It isn't that Blank is so good. The others in your department are so lousy that he's good by contrast!"

That Better Mousetrap

FOR YEARS NOW, advertising men have quoted that old saying about the better mousetrap. A couple of years ago, one who was smarter than his fellows even converted "Better" into a trademark. But the stopper is the newly announced "electronic" rat trap invented by a Chicagoan. It's a weird gadget of self-operating doors, tilting ramps, and electrodes, all powered from a light socket and with the inevitable electric eye. Our electronic engineer friends poohpoohed it as a Rube Goldberg—until somebody checked up and found the maker doesn't sell 'em, but rents 'em—and one killed 80 rats its first night in a food plant. That's a lot better than stalking behind the barn with a .22—and killing nothing but mosquitoes and an occasional chicken.

Tolerant Tolerances

DR. A. L. KLEIN, in a lecture on the West Coast hits again the idea of intolerant tolerances. He points out one thing that so many production men have kicked about before, the matter of tolerances that are so close they are nonsensical. Thermal expansion, the influence of size, variation in characteristics of various metals, relief of stresses in machining, elasticity and other factors affect all manufacturing. The successful designer must consider them if he is to establish tolerances which make for production economy.

'Till We Meet

U. S. MACHINE CORP., Lebanon, Ind., has solved the problem of the visitor waiting to see somebody who at the moment is busy. They hand him an attractive little 12-page booklet, printed in two colors, that tells him what to look for around the lobby, around town, in that area of the state, and then gives a few pertinent and interesting facts about the company. It's well-written, too.

Aluminum Canoes

ONE OF THE apparently facetious, but actually practical, reconversion plans we have heard is that of one section of Grumman Aircraft. The postwar product is an aluminum canoe with air cells at either end. It sounds fantastic, but the canoe is lighter than the conventional type, is practically non-sinkable, has greater strength, and the air cells are provided with hand holes to permit dry storage of such items as cameras and sandwiches. They tell us that an 18-ft. canoe flooded will support five men, in contrast with the usual canoe's ability to support only two. Perhaps, in line with the Grumman tradition of *Wildcat, Tigercat* and *Hellcat,* a proper name for the new product would be *Catfish.*

TIPS for Top Shop Men

5 Watch tool hoarders. Company inventory can go overboard because "favorite" tools are locked in personal toolboxes or lockers—so they are lost to the other shift or to other workers. A tool-checking system only tells you who's charged with each tool—the next stop is to be sure every tool gets maximum use.

6 Hypnotism isn't only a theatrical and medical stunt. It can occur in a plant. Blondes are usually considered a possible cause, but a more serious one is deadly repetitive motions. A horizontal arm or ram reciprocating behind a horizontally barred guard has been known to make an operator dopey and sleepy, if his work requires him to watch the motion intently.

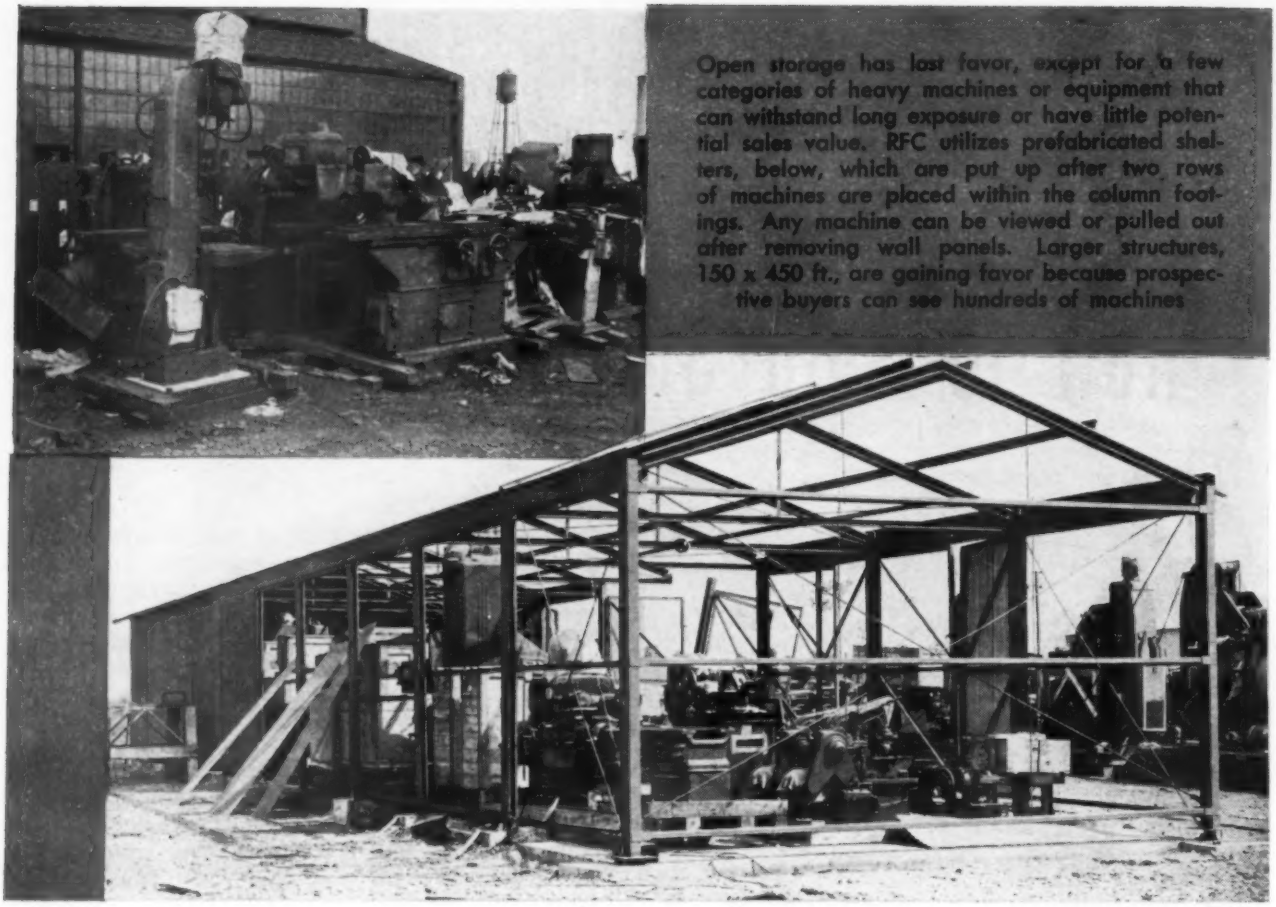
7 "Yes" men are very comforting, but not very helpful. They don't even make good sounding boards when you spout a new idea —their eager "ayes" interrupt your train of thought. Get assistants who disagree violently at times. They'll sharpen your own thinking if you can take it—and you'd better be able to, or you won't be dishing it out for long.

How to Ship Surplus Equipment

Peak movement of surplus equipment to RFC warehouses will occur this winter. Preparation of these machines for shipment will fall largely upon the shoulders of contractors, who must follow the regulations prescribed in the "Guide for the Storage of Plant Equipment and Termination Materials." This digest of the Guide was prepared after consultations with officials who took part in revising the procedures

THE PHYSICAL ASPECTS of plant clearance now confront the majority of war contractors. For a time after V-J day, activity centered about the paper work incident to more than 100,000 contract cancellations. But with inventories well on their way or already accepted, the next thing is to decide how and when to prepare any unsold government property for shipment to RFC warehouses. That job is too big for government agencies to handle alone; it will require cooperation from all quarters because estimates call for 40,000,000 sq. ft. of warehouse space by next spring. Besides, the government has rather strict ideas concerning how it wants machines prepared for storage, because it has an eye on getting the equipment into warehouses in good shape and then being able to sell it as promptly as possible.

In the long run, it is to everybody's interest that removal of surplus government-owned equipment from a contractor's plant should be delayed by certain safeguards. First, the contractor must initiate



Open storage has lost favor, except for a few categories of heavy machines or equipment that can withstand long exposure or have little potential sales value. RFC utilizes prefabricated shelters, below, which are put up after two rows of machines are placed within the column footings. Any machine can be viewed or pulled out after removing wall panels. Larger structures, 150 x 450 ft., are gaining favor because prospective buyers can see hundreds of machines

the plant-clearance project by filing an inventory of government-owned items and indicating those he would like to buy. Then for 60 days following the filing of an acceptable inventory, all hands—the contractor and representatives of the owning agency and the RFC—are expected to pitch in and try to sell the balance. This is the best time for liquidation because it saves the government the preparation, warehousing and transportation expenses, avoids the bother to the contractor of preparing machines for shipment and puts the machines or materials to effective use that much sooner. But when the 60-day grace period expires, the owning agency must declare any balance remaining unsold to be surplus and turn it over to the RFC for storage. However, there are instances where the owning agency feels it has a good chance to make a sale, and the contractor may contribute an idle nook for a longer time. There are many ways in which contractors can and do help the government to recover the maximum percentage of its investment while keeping down costs.

When preparation of equipment for shipment to RFC warehouses becomes the order of the day, the work should be carried out in accordance with the "Guide for the Storage of Plant Equipment and Termination Materials." Revised copies of the Guide will soon be available through branch offices of the RFC. This study was prepared for the Space Control Committee of the Surplus War Property Administration by the Army Service Forces, in cooperation with the Treasury, Navy, RFC, Maritime Commission, Federal Works Agency and WPB. A certain degree of familiarity with the provisions of the Guide is possessed by persons in contact with contractors. The Defense Plant Corporation held schools at 21 locations to explain preparation procedures. These schools were attended largely by DPC, RFC and Army and Navy representatives, although personnel from some war contractors and private warehousing companies participated.

Must Follow Guide

The contractor must assure himself that he, or the concern to which he subcontracts the work, is following the provisions of the Guide, and not procedures which may have been set up at an earlier date by various owning agencies. If his production contract does not include terms for proper preparation, a supplemental agreement or purchase order will be executed by the owning agency. Since the provisions of the contract call for obeying the Guide, the contractor is not relieved of responsibility if the shipment is accepted on a spot-check basis by the owning-agency inspector or DPC inspector and reaches the RFC warehouse in an improperly prepared condition. To avoid mishaps of this character, RFC personnel attempt to visit plants during termination proceedings for the purpose of consulting with owning-agency personnel.

Generally speaking, the degree of preparation of equipment for storage in government warehouses exceeds in many respects the processing normally applied by the machine builder who need only concern himself with hazards normal to direct shipment to a customer. Depending on type of machine the processing expense runs between 1½ and 6 percent of the purchase price, with about 4 percent the average. Another figure that has been used is $50 per ton, but this appears low for precision types of equipment. Greater amounts will be approved in exceptional instances.

GENERAL RULES FOR SHIPMENT OF SURPLUS EQUIPMENT

1. All machines shall be shipped assembled if weight and size permit. Anything that can be shipped by rail or truck can be handled at RFC warehouses.

2. Box loose accessories and tools.

3. Lower and lock machine heads. Provide adequate braces if deemed necessary.

4. Brace slides, counterbalances, flexibly mounted motors and other attachments securely to the machine itself. Box counterbalances if necessary, but try to use timbers if counterbalance can be reached through a slot or opening.

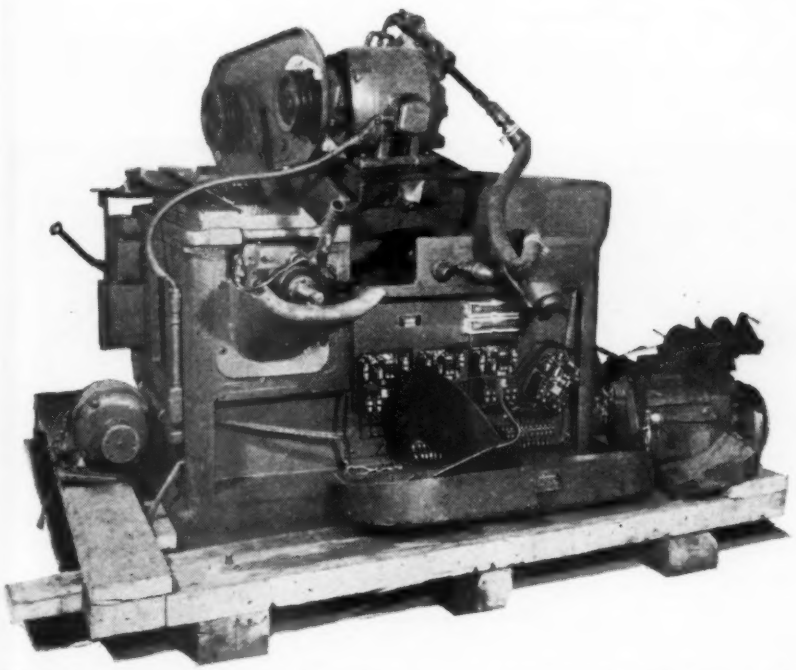
5. Brace projecting parts, such as motors, overhanging arms, table brackets and extended cylinders securely to the skid if dismantling would be difficult and entail further protective measures for mechanisms thereby exposed. If dismantling is is not too much of a problem and is outweighed by bracing difficulties, remove such elements and box or skid them separately. Good judgment is the criterion. If after blocking or bracing, there is a chance of shearing off the projection, remove it, particularly if inspection of fastenings indicates that they are not meant for shear loads.

6. It is better to over-skid a machine than to take a chance. Tall, topheavy machines should have an adequate skid base so that inclined bracing will prevent toppling during handling.

7. If parts and assemblies must be removed from the machine, those weighing over 500 lb. shall be skidded, those weighing less than 500 lb. shall be boxed and attached to the machine skid.

8. All attachments or accessories originally supplied with the machine are to be shipped with it. Items bought subsequently are to be treated as follows: If item is keyed to government machine inventory number for machine, said item is to be shipped with the machine. If item was bought for use with a line of machines and keyed to one machine number, it is to be shipped with that machine. If item was bought for use with a battery of machines but not keyed to any of the machine numbers, it is to be shipped separately.

9. Special tooling, gages and fixtures used on a given machine to manufacture a specific government part are not to be shipped with the machine, even though they are keyed to the machine inventory number.



WHAT NOT TO DO—Discovered in a government warehouse, this jumbled mass of junk was an expensive grinder that tumbled off the skid for lack of adequate bracing and hold-downs. How the lack of adequate preparation got by government and railroad inspectors is a mystery. Those who like puzzles will find that practically nothing was done right in preparing this surplus machine for extended storage. Now the argument rages over who will pay for the loss—contractor, railroad, or the government—which means "We, the people."

There are good reasons for the care with which machines must be cleaned, treated with rust-preventive compounds, painted where necessary, provided with heavy skids, braces and suitable shrouds. In the first place, no one knows how long the machines must stand in unheated warehouses before they find a buyer. In the second place, the extra care specified for extended storage is not expensive after all, in fact it is cheaper. The preparation cost for extended storage in unheated space might break down as follows: cleaning, 35 percent, preservative coating and shrouding, 25 percent, skidding, 40 percent. If the procedure were to be modified for storage in heated warehouses, the preparation cost would be reduced only 15 percent on the average, but the total cost to the government would soar because heated space costs four times unheated space in prefabricated shelters and warehouses being erected or used at 98 locations.

The contractor preparing surplus equipment for government storage will understand his job better if he appreciates the RFC point of view. When the Guide was first prepared, warehouse space was at a premium, construction materials were needed

for more urgent war purposes, the idea was to use open storage as much as possible. Of necessity, slushing compounds were to be applied liberally, shrouds and tarpaulins so covered the machine that it became a shapeless nonentity.

Under postwar conditions, RFC plans to store most categories of equipment in unheated warehouses and prefabricated shelters, wherein machines are easy of access and need not be so covered up that they are unrecognizable. Only the machined surfaces are to be coated with hard grease, painted surfaces are to be repainted if scuffed or unsightly, machines are to be assembled as far as shipping conditions permit. Shrouds will consist only of paper covers over motors, switchgears and points where moisture can enter. By leaving shrouds open at the bottom, the problem of condensation is avoided. The prospective buyer must be able to get a good idea of the machine's condition by an easy visual examination, which is to be supported by a certificate of good working order attested to by the contractor and inspector for the owning agency. In short, RFC intends to be a sales agent, not a storage organization. If this viewpoint is kept in mind when applying the rules laid down in the Guide, there should be no difficulty in having the work accepted by the RFC warehouse receiving the shipment.

Details of cleaning and anti-corrosion procedure to be applied to machines intended for extended storage were given in the previously published Reference Book Sheet, "Procedure for Storage of Surplus Machines." The sections that follow cover skidding, boxing, shrouding and identification.

RECONVERSION SECTION

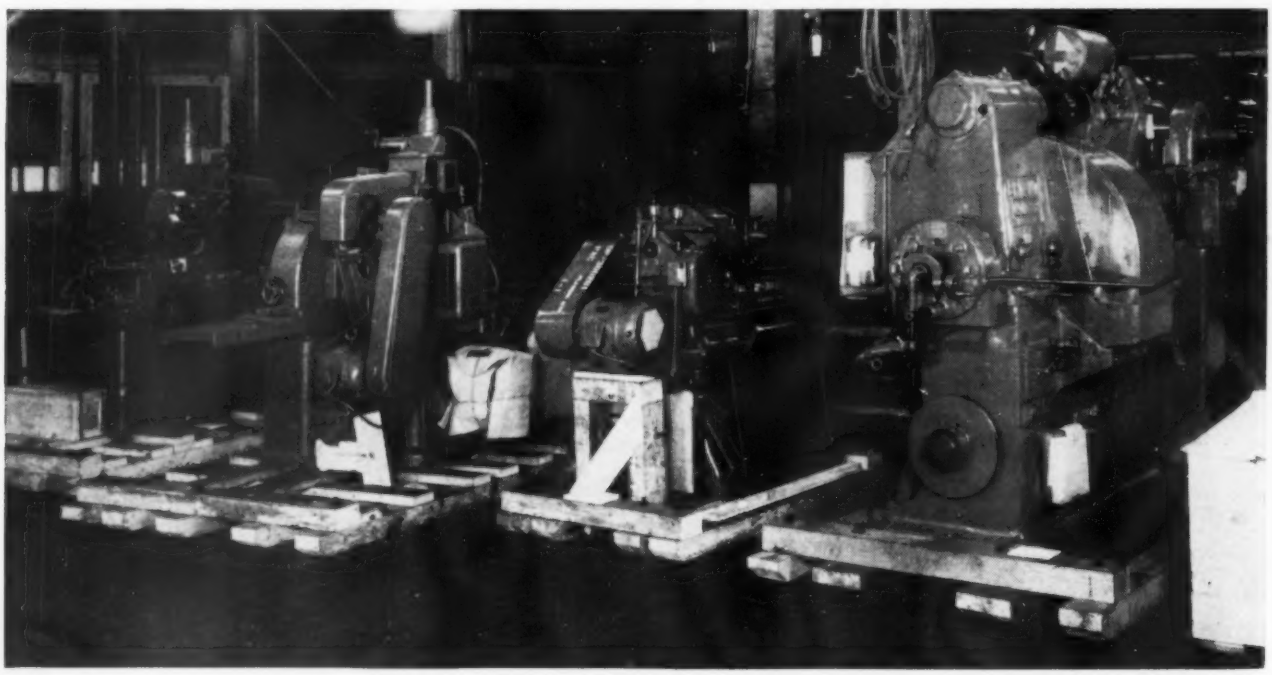
How to Ship Surplus Equipment (CONTINUED)

DESIGN OF SKID UNITS

ASSEMBLIES weighing 500 lb. or more shall be skidded in accordance with the following recommendations:

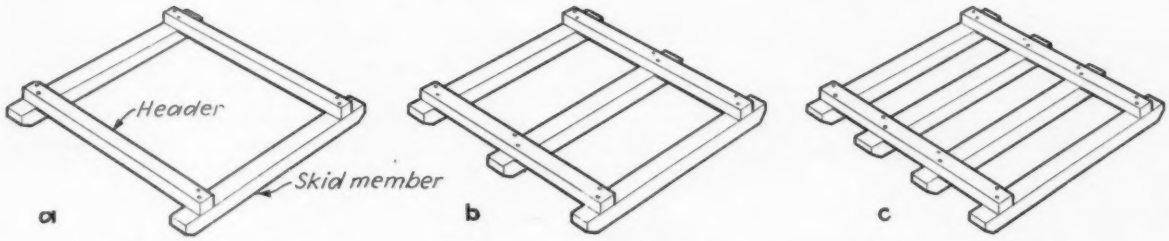
1. The skid unit shall project not less than 2 in. beyond the over-all dimensions of the machine. Outside skid members shall be parallel and of equal length.

Frequently, the skid unit must be much larger than the over-all dimensions of the machine. Tall, top-heavy machines must be adequately braced to the skid, and no bracing should ever be applied between the machine and the railroad car or truck. Government requirements for skid design and attachment to the machine are based upon the premise that the skid and machine will be practically a rigid assembly, and that the skid will be able to withstand "humping" during switching, lifting in slings or by lift truck, and movement on rollers, without setting up undue stresses in the machine. Therefore, bracing to another



As a general rule it is preferable to support machine bases directly on skid members if sufficient bearing of the base can be secured. The machine at left has an irregular base, is best supported on floor boards. The machines at center and right have rectangular bases and rest upon the skid members

SKID-UNIT DESIGNS FOR VARIOUS MACHINE BASES



TWO SKID MEMBERS
(Floorboards unnecessary)

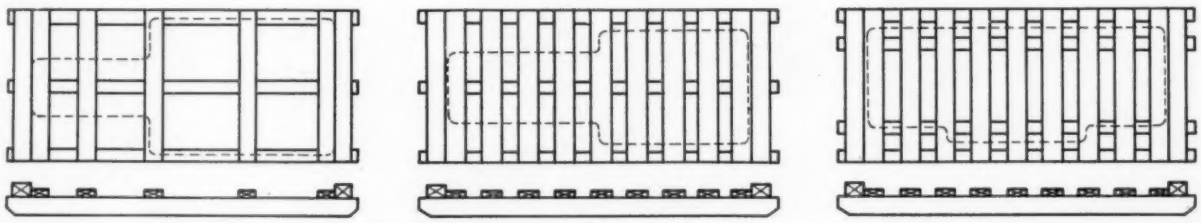
Used for machines which are not topheavy, are of any weight, have no side projections and possess: (1) rectangular location of legs or end frames, or (2) a strong rectangular base without flare. In both cases, the machine rests directly upon and is bolted to the skid members

THREE SKID MEMBERS
(Floorboards unnecessary)

Intended for stable machines that have: (1) legs and side projections, or (2) no side projections and a fairly strong rectangular base that is medium flared, when the base must rest upon all three skid members. This design is restricted to leg-type machines under 5000 lb.

FOUR SKID MEMBERS
(Floorboards unnecessary)

This skid unit is adaptable to leg-type machines, which may be topheavy and have side projections. Skid members are uniformly spaced when the machine has rectangular location of the legs; non-uniform spacing accommodates a non-rectangular location of machine legs



THREE SKID MEMBERS
(Floorboards required)

Both designs are limited to loads of 5000 lb., and are suitable for machines that have irregular bases and may have side projections: Left—the machine base (dotted outline) must be fairly strong and rest on all cross-pieces; it may have any amount of flare. If four skid members are used, the machine can be of any weight. Right—A weak irregular base with any amount of flare is taken care of with this arrangement

FOUR SKID MEMBERS
(Floorboards required)

No weight limit is applied to this design, which accommodates machines having a weak irregularly shaped base with any amount of flare and gives maximum support

entity would destroy the efficiency of the skid and possibly cause shearing of a vital machine part. So, skid units are made large enough to accommodate adequate bracing and to give stability to an otherwise topheavy structure.

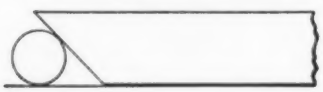
Suggested designs for skid units are given in the accompanying sketches. Photographs of skidded machines illustrate good practice in respect to skid construction, blocking and bracing.

2. Use a good commercial grade of Groups II, III or IV hardwood for skid material. If softwood must be used, increase the computed width and height of solid skids 2 in. each way to compensate for crushing by a sling.

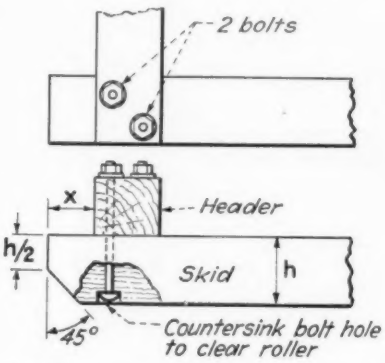
3. Determine size of skid members from the accompanying table.

4. Lamination or splicing or skids is permissible when one-piece material is not available. For this purpose, 2x4's 2x6's and 2x8's are recommended. Joints should be well distributed. Add one extra lamination to compensate for the inherent weakness of splices. For example, a 6x6-in. member would be made up of four layers of 2x6's with joints no closer than 4 ft. apart. Splicing is permissible only with laminated skids.

SKID END DESIGN



WRONG—A continuous bevel weakens the skid end, permits use of a large roller and easy breakage



RIGHT—A short bevel requires the use of a small roller, avoids damage. Distance *X* should prevent bolt hole from passing through the bevel

5. Bevel the skid ends at 45 deg. downward from the end. The beveled cut should be one-half the thickness of the skid.

6. Skid sizes for machines weighing over 20,000 lb. are determined by the formula $WL = 1600\ BD^2$, where:

W = gross weight of machine, lb.
L = unsupported length of skid in inches.
B = total width of skids, in.
D = depth of skid, in.

Example:

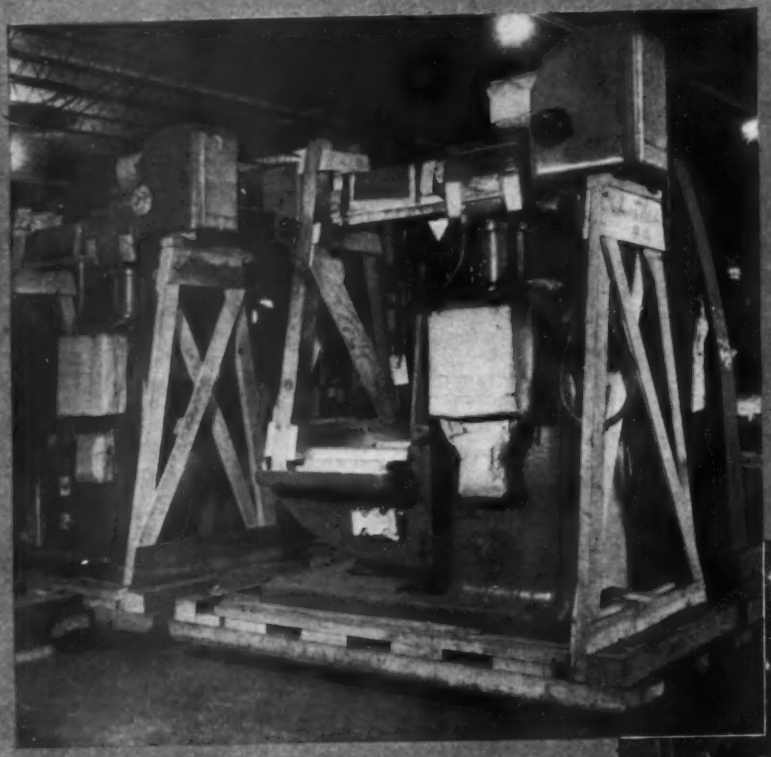
Assume a 30,000-lb. machine, a 120-in. span L between points of attachment to the skid, and the use of timbers 8-in. deep.

Then:

$30{,}000 \times 120 = 1600 \times B \times 64$

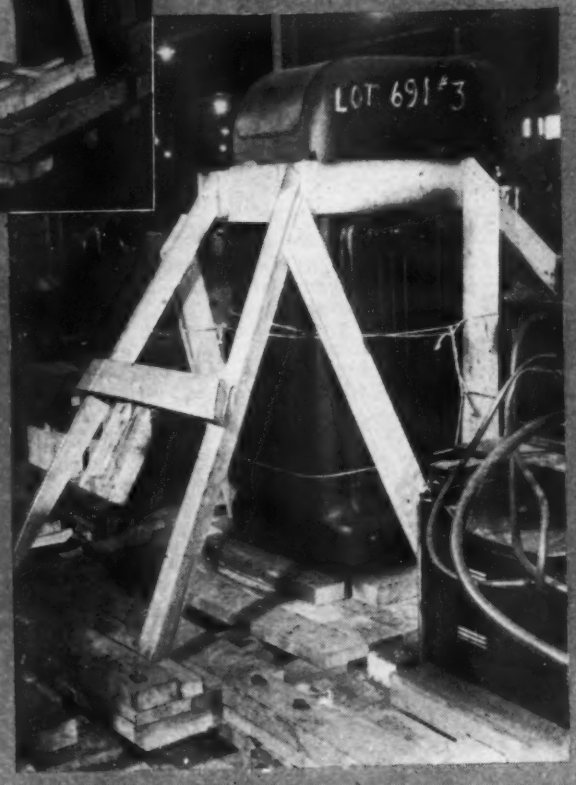
$B = 36$

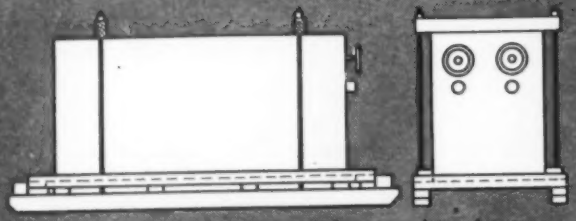
BLOCKING AND BRACING OF MACHINERY



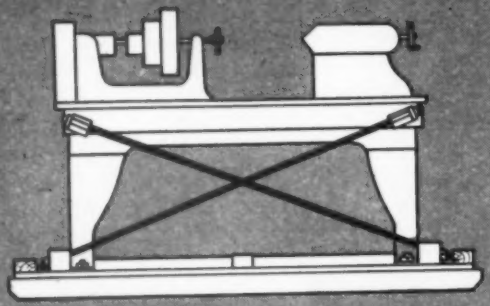
Never brace a machine to anything than itself or the skid unit. By bracing both ends of the overhung spindle head and drive assembly, the shipper took no chances of ruining the machine's alignment

Top heavy machines should be put on skids of sufficient oversize that braces can be inclined at a suitable angle. The extra lumber and labor costs little, and saves the chance of the machine toppling during shipment

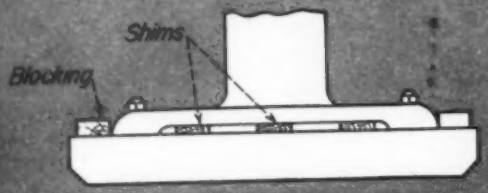




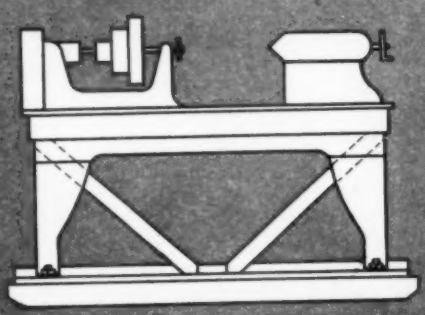
Use tie-rod hold-downs when machine base has no bolt holes



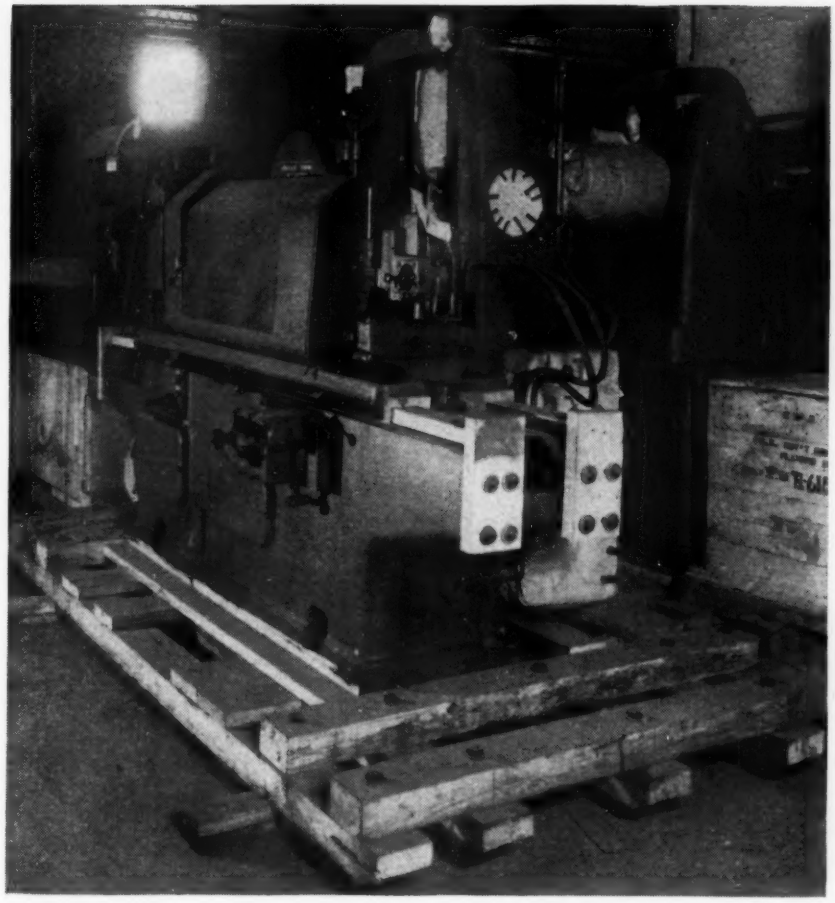
Cross tie-rod bracing of superstructure



Use of shims under machine



Diagonal bracing of machine



Adequate bracing of the table of this gear grinder will avoid mishaps during shipment. Although the machine is secured to the skid unit with four bolts, blocking is nailed adjacent to the base

If 6x8 in. timbers are available, six will be required for the skid.

7. Headers, or end-floor members, are determined as follows:

(a) Width and thickness shall be the same as for skids.

(b) End-floor members shall be spaced not more than ¾ in. from the ends of skids.

(c) Attach end-floor members with two bolts at each connection.

(d) Use ½ in. machine, carriage or step bolts, or nuts on threaded bars (Standard washers under nuts) to attach end floor members of less than 3 in. thickness; ¾ in. bolts for greater thicknesses.

8. Size of load-bearing floorboards is determined by the formula $WL = 1600\ B\ D^2$. Bolt load-bearing floorboards to skids in the manner described for end-floor members. Floorboards are not required if the sides of the machine bear directly on the outside skids.

9. Non-load-bearing floorboards

SIZES OF SKID MEMBERS FOR SKID UNITS FOR MACHINES WEIGHING LESS THAN 20,000 LB.

L=distance in feet between outermost hold-down bolts

Weight of Machine (lb.)	TWO SKIDS						THREE SKIDS						FOUR SKIDS					
	L=3	4	6	8	10	12	L=3	4	6	8	10	12	L=3	4	6	8	10	12
200	2×3	2×3	2×4				2×3	2×3	2×3				2×3	2×3	2×3			
400	2×3	2×4	2×4	3×3			2×3	2×3	2×4	2×4			2×3	2×3	2×3	2×4		
500	2×4	2×4	2×4	3×3	3×3	3×3	2×4	2×4	2×4	3×3	3×3	3×3	2×4	2×4	2×4	3×3	3×3	3×3
600	2×4	2×4	3×3	3×3	3×4	3×4	2×4	2×4	2×4	3×3	3×3	3×4	2×4	2×4	2×4	3×3	3×3	3×3
1000	2×4	2×4	3×3	3×3	3×4	3×4	2×4	2×4	3×3	3×3	3×3	3×4	2×4	2×4	3×3	3×3	3×3	3×3
1500	3×3	3×3	3×3	3×4	3×4	4×4	3×3	3×3	3×3	3×3	3×3	4×4	3×3	3×3	3×3	3×3	3×3	4×4
2000	3×3	3×3	3×4	4×4	4×4	4×4	3×3	3×3	3×3	4×4	4×4	4×4	3×3	3×3	3×3	4×4	4×4	4×4
2500	3×3	3×3	3×4	4×4	4×4	4×6	3×3	3×3	3×3	4×4	4×4	4×4	3×3	3×3	3×3	4×4	4×4	4×4
3000	3×3	3×4	4×4	4×4	4×6	4×6	3×3	3×3	4×4	4×4	4×4	4×4	3×3	3×3	4×4	4×4	4×4	4×4
4000	4×4	4×4	4×4	4×6	4×8	4×8	4×4	4×4	4×4	4×4	4×6	4×6	4×4	4×4	4×4	4×4	4×4	4×6
5000	4×4	4×4	4×6	4×8	4×8	6×6	4×4	4×4	4×4	4×6	4×6	6×6	4×4	4×4	4×4	4×4	4×6	4×8
6000	4×4	4×4	4×6	4×8	6×6	6×6	4×4	4×4	4×4	4×6	6×6	6×6	4×4	4×4	4×4	4×6	4×8	4×8
7000	4×4	4×6	4×8	6×6	6×6	6×6	4×4	4×4	4×6	6×6	6×6	6×6	4×4	4×4	4×6	4×8	4×8	4×8
8000	4×4	4×6	4×8	6×6	6×6	6×8	4×4	4×4	4×6	6×6	6×6	6×6	4×4	4×4	4×6	4×8	4×8	6×6
9000	4×6	4×6	6×6	6×6	6×8	6×8	4×4	4×4	6×6	6×6	6×6	6×6	4×4	4×4	4×8	4×8	6×6	6×6
10000	4×6	4×8	6×6	6×6	6×8	6×10	4×4	4×6	6×6	6×6	6×6	6×8	4×4	4×6	4×8	4×8	6×6	6×6
12000	4×6	4×8	6×6	6×8	6×10	6×10							4×4	4×6	4×8	4×8	6×6	6×6
14000	4×8	6×6	6×6	6×8	6×10	8×8							4×6	4×8	4×8	6×6	6×6	6×8
16000	4×8	6×6	6×8	6×10	8×8	8×8							4×6	4×8	6×6	6×6	6×8	6×8
18000	6×6	6×6	6×8	6×10	8×8	8×10							4×8	4×8	6×6	6×6	6×8	6×10
20000	6×6	6×6	6×10	8×8	8×8	8×10							4×8	4×8	6×6	6×8	6×8	6×10

shall not be less than 5½ in. width and 1⅝ in. in thickness when the machine weight exceeds 3000 lb.

10. Use as many bolts as there are bolt holes in the base. The bolt size is determined by the diameter of holes in the machine base. Bolts securing equipment to skids must pass entirely through the skids, and bolt heads should be sunk in counterbored holes. See sketch. Prohibited are: (1) bolting through floorboards only, and (2) Use of lagscrews.

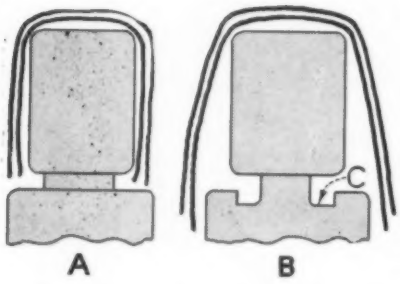
11. Tie-rod hold-downs are permissible where equipment cannot be bolted directly to skids.

12. Apply thin-film rust-preventive compound (AX5-673, USN 52-C-18 Grade I or AN-C-52 Grade I) to nuts and threaded end of all bolts used for assembling the skid.

Note: *Defense Plant Corporation has an index of "Plancor," establishments (DPC plants) where there is available a supply of lumber, nails and bolts left over from plant construction. Apply to the nearest DPC branch office for information.*

How to Ship Surplus Equipment (CONTINUED)

APPLY SHROUDS SPARINGLY



Cover motors with two shrouds. For the vertical motor mounting A, the shrouds need project down only as far as shown. In the mounting B, the recess C can collect water, so bring the shroud down farther

IT IS definitely contrary to RFC policy to cover up the entire machine with a shroud. Machines so treated are much more likely to suffer deterioration through corrosion brought about by condensation of moisture within the inclosure. In addition to being unnecessary and bad for the equipment, complete shrouds interfere with ready examination by prospective purchasers. As a consequence, regulations call for application of shrouds only to motors, switchboxes and other mechanisms that would be damaged by the entrance of rain and dust. These shrouds must be left open at the bottom to allow free circulation of air. General instructions for shrouding are:

1. Use materials meeting requirements of Type E-3 or L-4 waterproof paper (Spec. JAN-P-125).

2. Cover only the top and sides of motors, switchboxes and electrical control mechanisms with two complete shrouds applied smoothly to shed water. Seal joints in the paper with adhesives or compounds such that seams will be as waterproof as the paper itself, or tie covers securely with twine or wire.

Some means must be taken to avoid entrance of water and dust to working parts of the equipment. But judgement is required in the sealing of openings. There is no point in putting considerable labor and material into sealing an opening, just because it happens to be an opening. For example, do not attempt to close a large opening on the underside of a machine member, because any feedscrews or shafts contained therein are protected with corrosion-preventive compounds and the collection of water is impossible. Vents and louvers should not be covered. Other small openings may be sealed with Type 1, Grade B water-resistant adhesive tape (Spec. JAN-P-127). Use the shrouding material above to cover larger openings and seal with the tape mentioned. Depressions where water will accumulate may be covered with a shroud or filled with corrosion-prevention compounds of the grease type. Apply these compounds to attachment holes left bare by removal of machine elements. Often a lot of trouble can be saved by merely providing a tapped drip hole at points where water might accumulate.

Greaseproof wrapping paper, Grades A or C, (Spec. Jan.-P-121) must be inserted between any metal surface and blocking or dunnage to avoid marring the machine.

There is only one instance when complete shrouding is used—to act as rain and dust shields while the machine is enroute to warehouse on a truck or flat car. Such shrouds are removed upon arrival.

HOW TO BOX LOOSE PARTS

1. Treat items to be boxed—tools, change gears, loose accessories, machine parts that must be removed from equipment to avoid damage in shipment — with rust preventive-compounds, as described in the previously published Reference Book Sheet, "Procedure for Storage of Surplus Machines."

2. In the case of parts that must not be scratched, wrap in greaseproof paper, Grades A or C, Spec. Jan-P-121.

3. Pack items in nailed boxes of Styles 2, 2½, 4 or 5, Spec. Jan-P-106. Unless otherwise specified, boxes are to be lined with waterproof paper conforming to Types E-2, H-2 H-3, H-4, L-2 or M, Spec. JAN-P-125. Wedge parts securely with blocks or paper to avoid damage to the items themselves or breakage of the box through movement of heavy pieces during shipment. After parts are packed, fold the top closure of the liner at least twice to prevent entrance of water.

4. Fasten box top with screws. Strapping is not required.

5. For boxes designated to be stored outdoors, a sheet of Type E-1, E-2, E-3 or E-4 reinforced waterproof paper (JAN-P-125) shall be securely fastened to the top of the box to prevent entrance of water, and the marking on the box top repeated on the covering sheet.

IDENTIFY ALL SHIPMENTS

1. Each skidded machine and each box of parts shall be conspicuously and clearly marked with waterproof paint or stenciling ink, and the marking covered with clear, waterproof lacquer.

2. Government property number—this must appear on the machine itself and all boxes of parts.

3. Package number—this shall denote the total number of items, that is, the machine itself plus total number of boxes. For example 1/10, 2/10 . . . The piece of equipment is always marked 1/10; the boxes are marked with the fractional package number 2/10, 3/10 . . . , below the government property number.

4. Packing lists—a packing list shall be placed inside each box and a duplicate inclosed in a waterproof envelope and attached to the outside of the box.

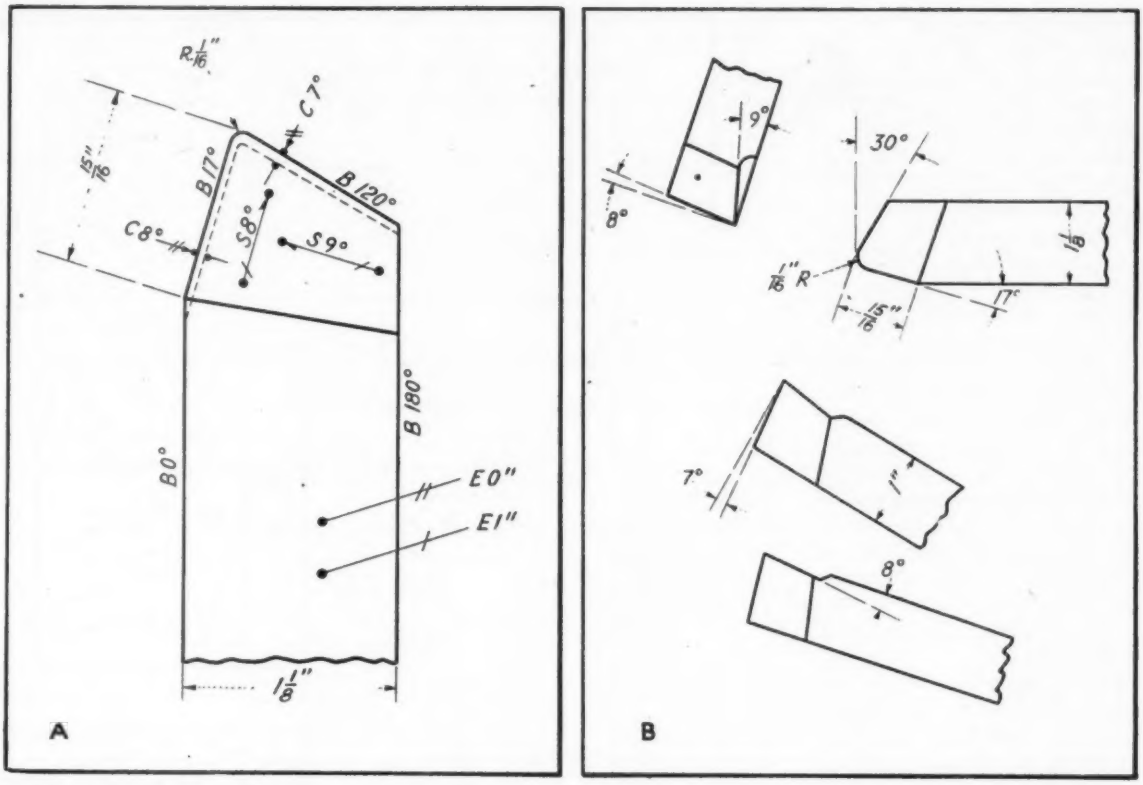


Fig. 1—By the use of survey principles one view A of a turning tool provides information equivalent to the conventional four views shown in B. Tolerances may be indicated conventionally if required

Land Survey System Adapted to Shop Drawings

Single-view drawings of tools given benefit of depth by use of land survey principles and symbols. Reading is simplified and the tool setup facilitated

BY MARK W. PURSER

AMONG the conventional methods of giving depth to mechanical drawings are the parallel oblique, isometric, cut-away, phantom and perspective. However, about 90 percent or more of the shop drawings generally used are made in the draftsman's standard form of showing plan and elevation projections on two or three different and mutually perpendicular planes. In certain cases oblique projections are also shown. Regardless of the conventional type of drawing, a substantial amount of time is involved.

A method which may be used to advantage in certain mechanical drawing requirements is an adaptation of some of the principles used by land surveyors. While it is not a complete system in itself, it may be combined intelligently with any of the conventional methods of drafting. When properly used, this system offers a number of advantages:

1. Drawings may be simplified.
2. Drawings may be made faster.
3. Less paper is required.
4. Fewer different views of the subject are needed.
5. It can be easily understood by trainers.
6. Machine setup may be facilitated.

In applying this system, a simple code is used for reading the drawings. In the accompanying code, the turning tool shown in Fig. 1A is seen to be 1⅛ in. wide, 1 in. deep and with both the top and bottom surfaces of the shank flat and parallel to the plane of the paper.

The sides of the shank are also parallel, the lead angle of the tool is 17 deg. and the length of the side cutting edge (without the nose radius) is 15/16 in. From this single drawing it is also seen that the nose radius is 1/16 in., the end cutting edge angle is 30 deg., the side clearance angle is 8 deg., the front clearance angle is 7 deg., the back rake is 8 deg. positive and the side rake 9 deg. positive. To indicate this information conventionally, as in Fig. 1B, four different views are necessary. Similar comparisons are shown

for a dimensioned piece in Fig. 2.

The reader of this type of drawing is often spared the trouble of looking over various views trying to find some dimension, as many drawings are suitable for simplification by this system. One particularly good application is in assembly drawings. In many cases a machining setup may be accelerated and simplified. For instance, in the tool shown in Fig. 1A, instead of specifying back rake and side rake separately it is sufficient to merely specify the maximum slope and bearing of the rake plane. The back and side rakes would then be indicated automatically. From this the tool grinder could set up his machine more easily for grinding the face of the tool, rather than having the inclination of the face specified in compound-angle from. Tolerances, where necessary, may be shown on the drawing in the usual manner.

Aviation companies have made use of a similar system for certain types of tool drawings and have found it expedient, both for the saving of drawing time and for giving comparatively inexperienced shop help a working acquaintance with specifications.

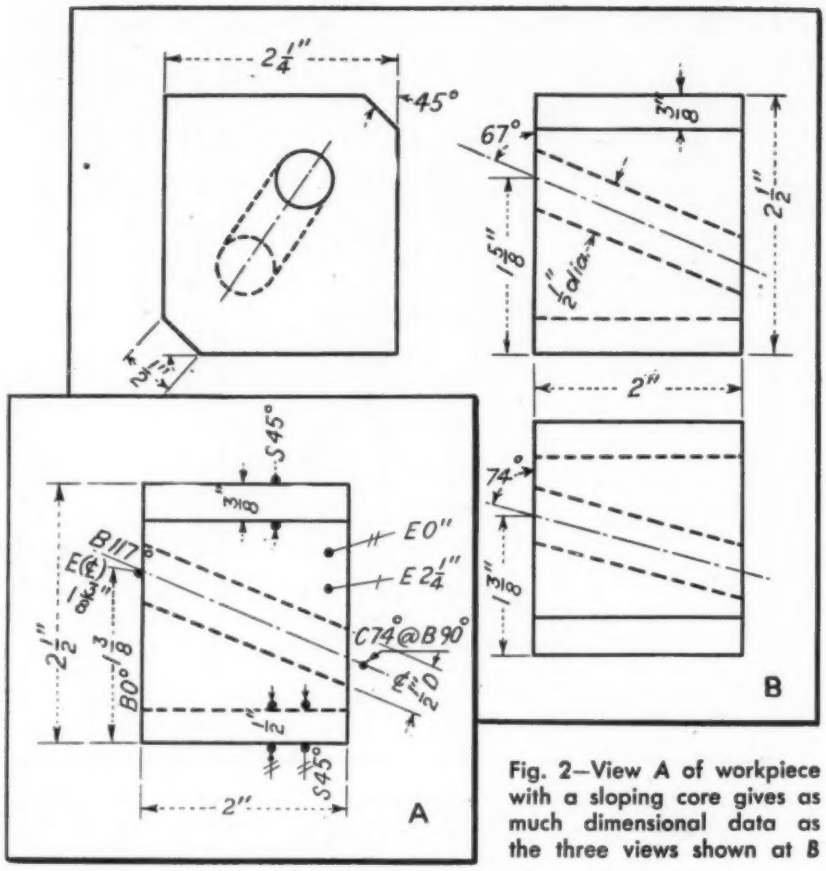


Fig. 2—View A of workpiece with a sloping core gives as much dimensional data as the three views shown at B

LAND SURVEY SYSTEM CODE FOR DRAWINGS

Paper plane (or PP)

Any plane parallel to the plane of the drawing paper.

Normal plane (or NP)

Any plane perpendicular to the plane of the drawing paper.

S2° or S2°
Arrowhead is at upper end. Line is inclined at 2 deg. slope

Indicates a reference line of maximum slope in any plane. Thus it represents the inclination to the paper plane of the plane to which it refers and may be called a "maximum slope line."

C30° or C30°
Arrowhead is at upper end. Line is inclined at 30 deg. co-slope and its slope is 60 deg.

Indicates a reference line of minimum inclination to the normal plane. Thus it represents the inclination to the normal of the plane to which it refers. It may be called a "minimum co-slope line." The co-slope of any line or plane is equal to the complement of the slope.

Indicates a contour reference line. All points on a contour line lie on the same paper plane and are points of equal elevation above any given paper plane used as a reference or base plane. This base plane is analogous to sea-level in land surveying.

S2° or S2°
Half arrowhead is at upper end. Line is inclined at 2 deg.

Indicates a slope line. Used to indicate the slope of lines, or the component slopes of oblique planes.

Refers to a surface or part of the material into which the viewer would be looking if the piece were transparent.

C30° or C30°
Half arrowhead is at upper end. Line is inclined at 30 deg. co-slope, or 60 deg. slope

Indicates a co-slope line, which is used to show the component slopes of plane surfaces inclined at compound angles.

Refers to a surface or part of the material out of which the viewer would be looking if the piece were transparent.

E(A)2"

Means that the elevation of the point, line or plane "A" is 2 in. above that of some reference paper plane whose elevation is zero.

E(M)(A-1")

Means that the elevation of the point, line or plane "M" is 1 in. less than the elevation of the point, line or plane "A".

North, West B270°, B90° East, South B180°, B0°

"B" represents the bearing relative to some zero deg. reference line. It is easiest to consider the latter as running due north.

2" or 2"

Represents actual or sloping distance between points, lines or planes.

Practical Ideas

HAVE YOU A PRACTICAL IDEA? . . . If so, send it in. Your idea will help other men, in other shops, who have a problem similar to yours. We pay for acceptable contributions prepared exclusively for this publication

Music Wire Straightened in Lathe With Revolving Bent Brass Tube

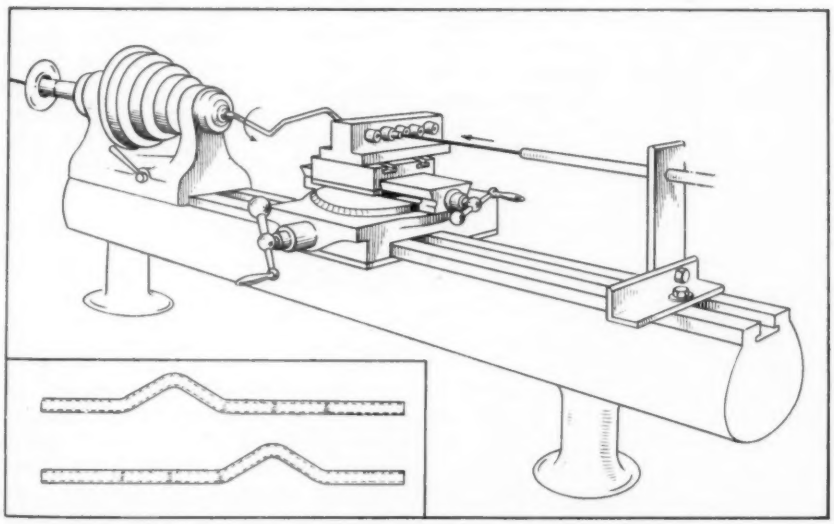
DOUGLAS LESLIE
Westinghouse Electric Corporation

Wire bought in large-diameter coils has a curl which is inconvenient for handling in manufacturing operations. To remove this curvature a piece of 3/16-in. I.D. by ¼-in. O.D. hard brass tubing was bent to have two knees at right angles to one another. These knees each have an included angle of 120 deg.

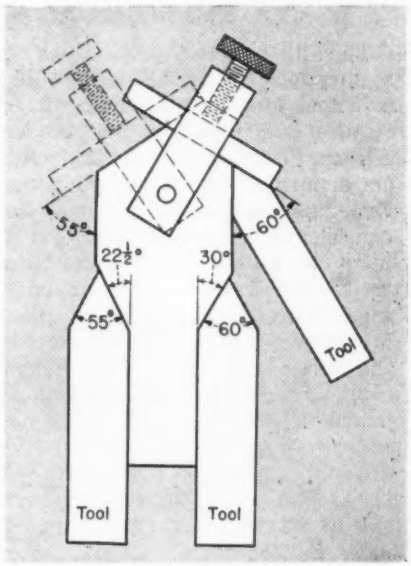
Preparation for the removal of the curvature from the wire is as follows: The bent tube is chucked in a spring collet at one end and supported by a steadyrest at the other. A straight piece of tubing is mounted at the tailstock end to hold the curved wire before it is fed to the straightener. There is free space between these two tubes.

Operation proceeds as follows: The wire is cut into convenient 5-ft. lengths, then it is fed through the straight tube; feeding into the bent tube requires pliers to prevent rotation. The lathe is run at about 1000 r.p.m. At this rate, the wire has a tendency to feed itself, the pliers prevent rotation and the straight tube prevents whipping of the free end of the wire while the plier is shifted. The result is that the wire comes out straight with the exception of the last 6 to 12 in.

Should volume of production warrant it, the process could be made full-automatic by developing a device to measure and cut the wire *after* straightening, and some type of self-operated reciprocating clamp to take the place of pliers and operator.



Tube gripped in collet takes coil curvature out of music wire. Insert shows tube bends 90 deg. apart



Centrally ground toolbits are obtained by gaging against side of tool, then checking included angle with the yoke

Checking Gage for Grinding Threading Toolbits

BY GEORGE B. WASHOWICH

The advantage of this gage is that the points of all toolbits which have been ground using it are symmetrical with respect to the axis of the tool, and are therefore identical. When bits must be changed frequently, this becomes especially desirable, because the resetting and adjusting time is greatly reduced.

The tool is constructed by shaping a piece of flat stock with the angles shown in the illustration, and fitting a pivoted yoke over the pointed end.

To grind a National-form thread tool (60 deg.), the *left* face of the bit is ground first and checked against the side of the gage and up against the 30-deg. angle (right side). When this is correct, the yoke is swung to the right and a piece of ground flat stock clamped with the

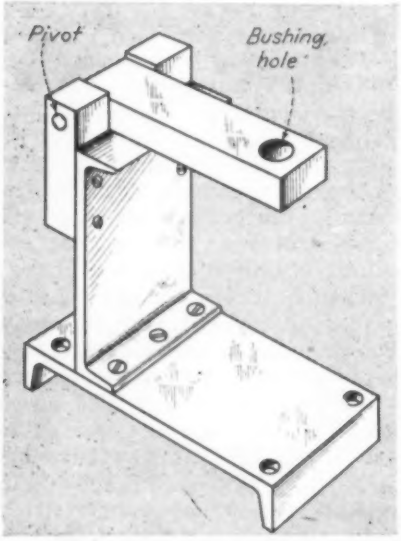
screw provided. The *right* face of the bit is now ground until it fits perfectly into the 60-deg. notch formed by the projecting piece and the side of the gage.

In similar manner, Whitworth thread tools are checked with the yoke to the left, by grinding the right side of the toolbit first.

Hinged Drilling Jig Aids Small Drilling and Tapping

OSCAR M. STIEGLER

This jig suggests possibilities for applications of wide scope. The principal idea is the hanging finger feature which permits another operation to follow the drilling without disturbing the set-up in any way. Fundamentally, the construction consists of a bracket arranged to have a hinged projection bored to receive various sizes of bushings. This finger, when in place, is supported as a cantilever, by the hinge and the vertical member, and when it swings back, is adjusted to be well clear of any possible work to be performed, and yet quick to replace in position For a production job, a permanent fixture should be included for the workpiece, but for small jobs some sort of quick-acting vise or clamp would undoubtedly make the unit a valuable piece of equipment ready to handle whatever comes along. It should be particularly valuable in drilling and tapping small holes in curved surfaces.

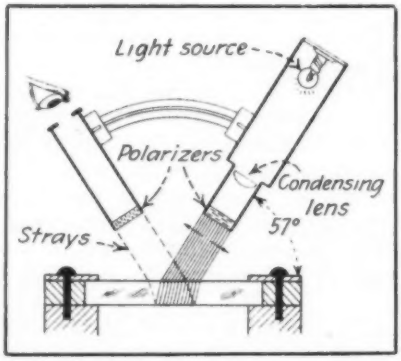


Hinged bushing leaf swings clear to make room for tapping operation

Collmascope for Testing Optical Windows for Impressed Strains

ORVILLE L. ALTENBERG
Naval Drydocks, Terminal Island, San Pedro

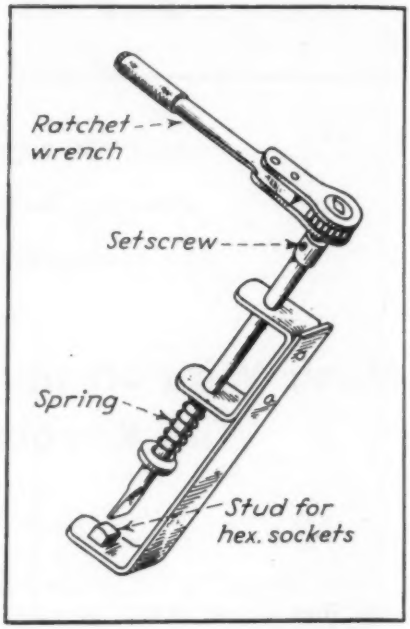
The glass windows or covers on miscellaneous control equipment are often mechanically strained during assembly. When polarizers are set at right angles, one on each side of the glass, strain can be recognized by a subtle emission of feathery light. Often it is impossible to get on both sides of the glass, and so this reflecting type of instrument was developed. The Naval Gun Factory upon testing this device commented as follows:



Polarized light reveals surface irregularities in instrument windows

"It may be of interest to note that if the collimator is rotated so that the incident light strikes the glass at the polarizing angle (about 57 deg.) and the polarizer oriented so the light vibrates in the plane of [the angle of] incidence, the polarizing element in the eyepiece can be discarded without changing the results. Under these conditions the rear surface of the plate acts as a second polarizer which is at right angles to the first one.

"In the mapping of regions of strain, the usual transmission methods are always to be preferred because they are the most closely connected with the manner in which the plate is used. The Naval Gun Factory therefore considers the device as an aid only in cases in which transmission methods cannot be used. This device however, has many useful applications of educational value in the study of polarized light." *Suggestion submitted under the Navy Employees Suggestion Program.*



Screwdriver with ratchet lever handle combined with socket wrench in rigid frame holds and tightens bolts in one operation

Ratchet Tool Quickly Tightens Inaccessible Hose Clamps

JOHN CROCE AND RICO DE NADAL
Naval Air Station, Quonset Pt.

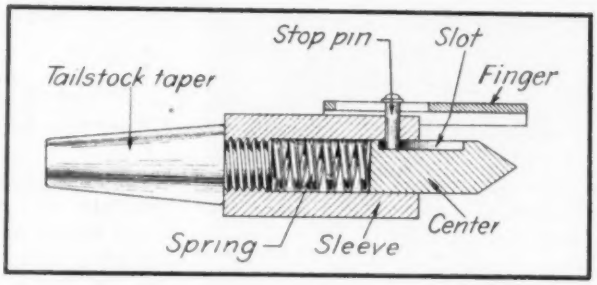
A common annoyance is the job of tightening stove bolts in hard-to-reach or flexible places. This tool has developed specifically for aviation ignition harness clamps but suggests many other uses.

The strip-metal frame holds the screwdriver and nut socket in alignment and the spring tends to keep the blade in the screw slot once it is placed there. A ratchet handle provides leverage and permits rapid tightening in confined spaces. *Suggestion submitted under the Navy Employees Suggestion Program.*

Spring Center for Lathe Tapping

ALBERT F. CASHMAN
United Air Lines, Chicago

Using the tailstock to center and feed a tap presents the double problem of keeping the center against the tap without strain, and, lacking sensitivity, knowing when to stop when working in blind holes. This tool solves both problems efficiently: A spring takes care of the automatic



Tailstock center combines automatic spring feed and adjustable lug to hold the tap, then release it at correct depth of thread

feeding, and an adjustable finger allows the dog to free itself when the tap has reached the correct depth. With the work chucked in the headstock, the tap and dog are set into the hole and the tailstock brought up and the spring center fully compressed. The desired thread is then set by adjusting the finger until this measurement is obtained between the end of the dog and the end of the finger. Now, when the lathe is started, the center will automatically follow the tap with uniform pressure, and as soon as the thread is complete, the dog will clear the end of the pre-set finger releasing the holding torque and allowing it to turn freely.

Construction is simple: The taper shank from a discarded drill is turned and threaded to fit a tapped steel sleeve; a rod to slide in this sleeve is prepared by machining to proper diameter, milling a keyway, and turning the center point; with a suitable compression spring inserted, the center pin is held in place and a press-fit stop pin driven into the sleeve preventing rotation of the center and restricting its travel to proper limits. A small piece of angle stock properly slotted serves as the finger and a screw is provided for locking it at the desired setting. *Suggestion from the Board of Individual Awards, War Production Drive.*

Worms Cut on Plain Miller By Geared Attachments

ROSS A. SCHULTZ
Foreman, Noble & Forrest, South Australia

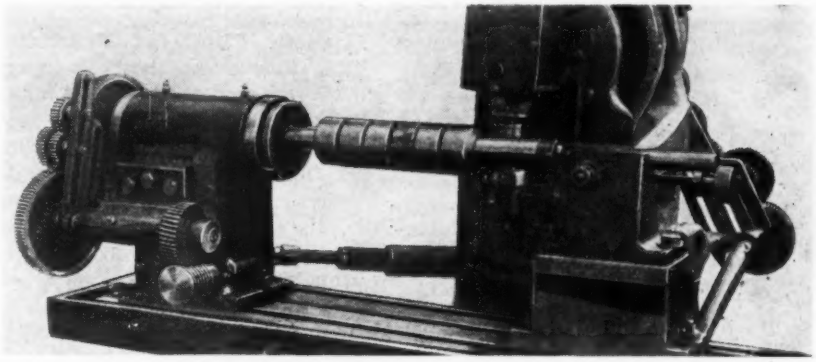
The manufacture of worms and worm wheels on a plain milling machine is unusual, and yet the methods and materials involved have been efficiently applied in this example. The main spindle and back gear were used as take-off points for the various gear trains, which drive the milling table and rotating workhead.

The front view of the machine shows the geared swiveling head attached to the main spindle which drives the hob, and the enclosed bearing below which prevents entrance of chips. The degree of lead is controlled by a bolt fastening to the column through a curved slot in the base plate of the cutter head.

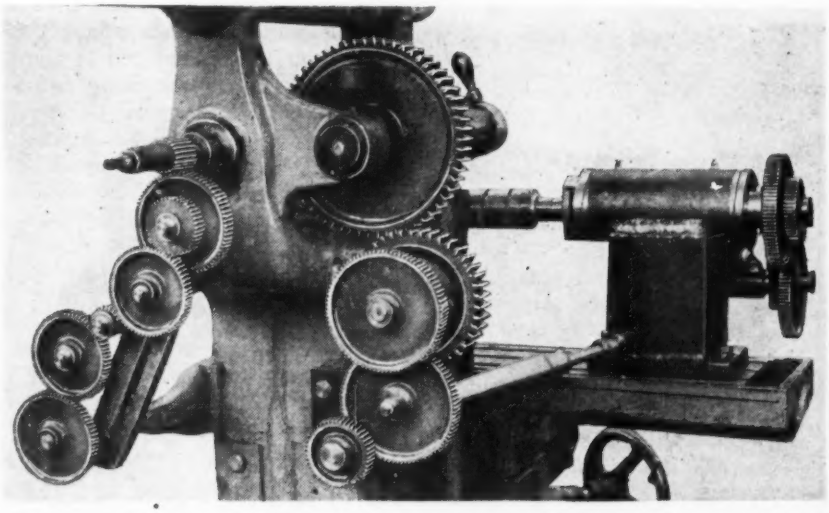
Any desired rotation of the workhead is obtainable through the two sets of change gears, shown in the close-up photograph. The drive is taken from the large back gear and transmitted through the first set of change gears to the universal jointed telescoping shaft. On the base of the workhead is a worm-and-wheel speed reducer leading to the second set of change gears and to the mandrel itself.

The table drive is similar: starting from a pinion fastened to the end of the main spindle, drive is obtained through another set of gears, and to the table with universal joints and telescoping shaft.

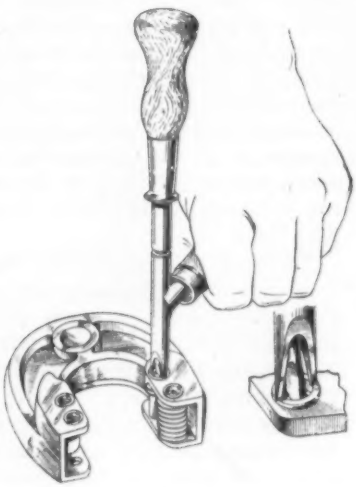
With the hobbing angle variable, and change gears to gain any table speed and work rotation, the milling machine is prepared to handle a wide range of gear cutting and other work on centers.



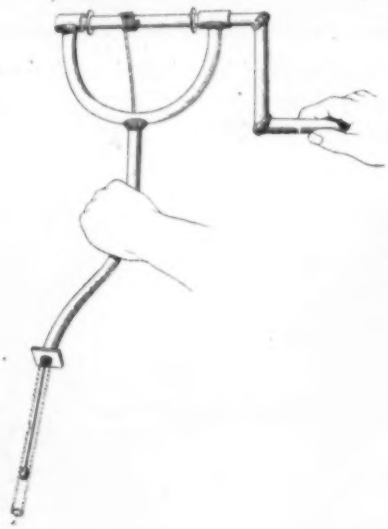
Bevel gears drive the swinging cutter head secured by a bolt through the slot in its base; six gear blanks are supported on a mandrel between tailstock center and geared workhead



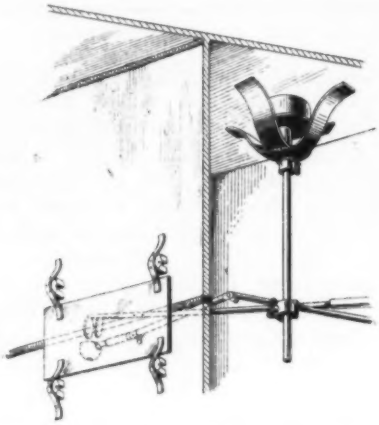
Change gears taking off from the back gear drive the workhead and the change gears from the main spindle pinion control the table feed



Spanner-Setscrew Driver—Snap gages, such as the Pratt & Whitney here shown, have the adjusting screws concentric. Customary procedure employs two screwdrivers and cut-and-try fiddling. A piece of tubing was ground wedge-shaped, making two points. A handle was attached to make an "interrupted screwdriver" or spanner wrench. Another screwdriver is simply inserted in the tube and then both screws are tightened simultaneously. *E. F. Calvert, Goodyear Aircraft, Akron.*

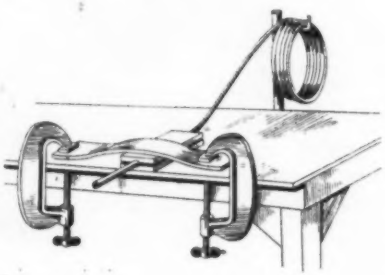


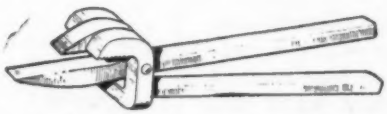
Repairing Flattened Tubing—Short lengths of soft tubing, accidentally flattened, can be quickly restored on the spot. There are several sizes of ball to fit different tubing. The proper one is selected and threaded on the cable which is then threaded through the tube and attached to the axle. The frame is held against the open end of the tube, and the ball forced through the obstruction with the winch crank provided. *Robert O. Lange, Naval Air Station, Corpus Christi.*



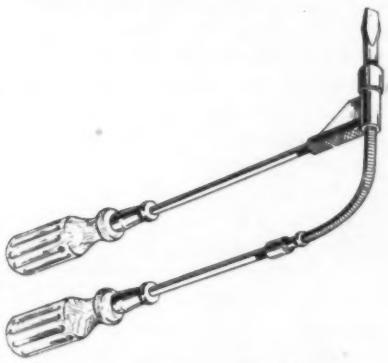
Magnetic Clips and Brackets—The illustration shows a magnetic stand on one side of a bulkhead and photographic film held opposite with four magnetic clips set up for radiographic weld analysis. The stand is built from a discarded permanent-magnet loudspeaker with four legs to support it right side up when the magnetic power is not desired, and the clips are riveted to horseshoe magnets. *John H. Cusick, Navy Yard, Mare Island.*

Wooden Die Straightens Tubing—A couple of half-round groove blocks clamped to the bench eliminate the frequent annoyance of kinked and bent new copper tubing and laborious hand straightening. The roll is hung nearby and the clamps can be easily regulated to give sufficient resistance to do the job without undue strain. *Harry F. Judson, Douglas Aircraft Co., Chicago.*

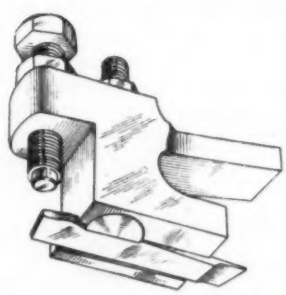




Sheet-Metal Pliers—Developed to facilitate the handling of large plates in the paint shop, this tool can lift a sheet from the pile and grip it firmly. The long lower jaw acts as a pry (replacing a screwdriver or other makeshift) and the short double jaw comes down, giving the operator considerable control over the work. *John B. Chase, California Shipbuilding Corporation.*



Flexible Screwdriver—Built to reach inaccessible screws and nuts in all kinds of instruments, this tool has two handles: one positions and holds the bit (whether Allen, Phillips, plain, or hex socket gripped in collet chuck) while the speedometer cable handle is turned from a convenient angle. *James R. Harvill, Naval Air Station, San Diego.*



Cutting-Off Tool — To simplify and expedite bushing and spacer production, using inexperienced hands, this tool has been made with an adjustable stop, thus making it self-contained and ready for any work of this character. *John H. Leach, Naval Air Station, Jacksonville.*

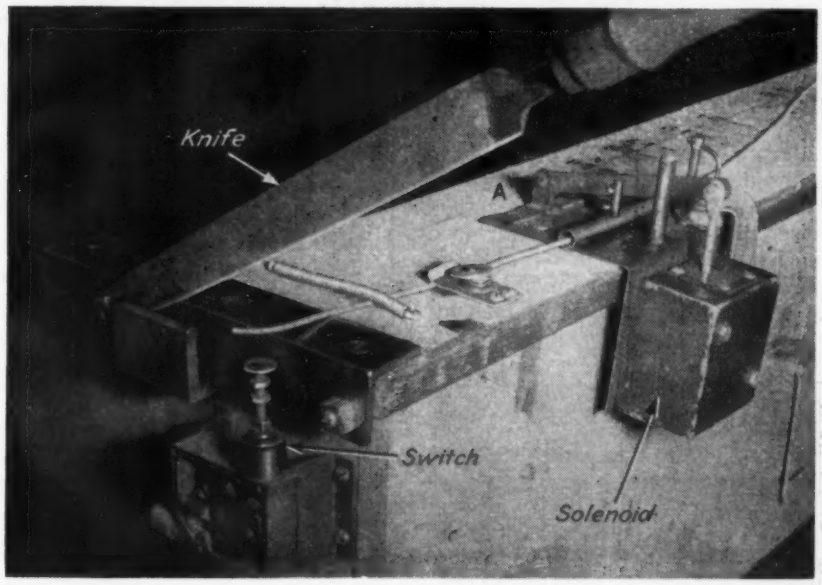
Automatic Electric Marker for Rapid Wire Cutting

FRED RAYSER
Production Engineer Fleetwings Division, Kaiser Cargo, Inc.

The cutting of long lengths of wire was a tiresome job in the electrical department until Robert C. Bard developed an electric wire marker that enabled an operator to mark and cut the wire as fast as it could be unreeled.

The old method was to take the end of the wire, walk the distance to be cut, fasten the wire, walk back to the spool and then cut the wire. With the wire marker, the operator can remain seated while he draws the wire toward himself. The marker is clamped on the edge of a scaled bench at a predetermined distance and the wire passed through a tube which has a small, vertical hole midway. A hollow shaft, terminating in an inked felt pad, descends through the hole and contacts the wire, leaving a clearly visible mark. The shaft is filled with ink so that the pad is supplied by a gravity feed without attention from the operator. The marking shaft is attached to a diagonal lever actuated by a solenoid.

In operation the wire is drawn through the marker to the end of the bench where it is cut by a knife attached to the bench. As the knife descends it presses a button which energizes the solenoid and thus marks the wire for the next cut.



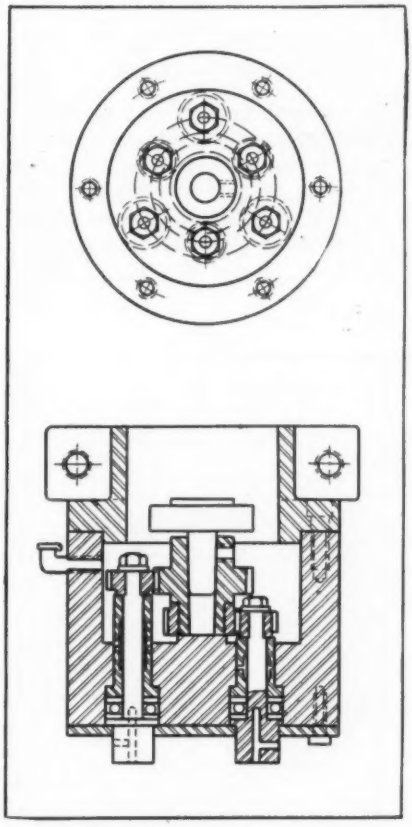
Solenoid-actuated inked rod marks wire when descending knife closes circuit

Multiple-Spindle Drill Head for Closely Spaced Holes

PATRICK J. O'HARA

The tool was developed in the days of shortages and delays, and when quick production was of the essence, but nevertheless, it is no makeshift, and possesses unusual features.

The particular problem called for six No. 48 holes, three equally spaced on one circle, and three on a smaller circle, which meant that two gears on the center spindle were required to obtain the correct radii. As the drawing shows, the construction, is simple, and in use, it has proved successful. Subsequently, the same unit was duplicated for the tapping operation which followed, using different sockets to hold the six taps, and with this head, very little breakage resulted. All the work involved was performed on inexpensive production-type drill presses.



For drilling small holes, gear trains in the head provide high speeds with less wear on the power supply, and the sockets assure rigidly accurate clamping

Application of this idea could be if greatly broadened by converting the unit into a turret head, and making a set of bushings so that any size of drill or tap could be quickly fitted. Also, if desired, by using various gear trains and different head plates, almost any pattern and number of holes up to about ten could be prepared.

The step-up ratio in the head permits the machine to turn slowly while the drills go as high as 10.000 r.p.m., resulting in higher production and greater efficiency.

Hydraulic Feed Unit Prevents Breakage of Drills

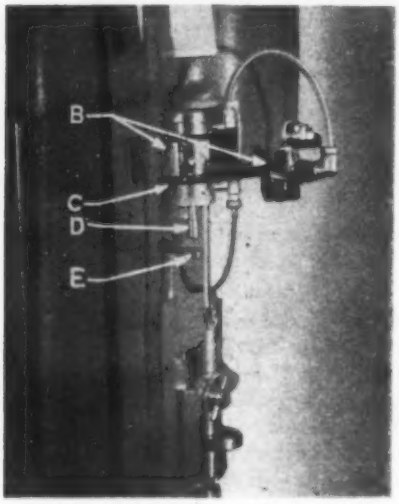
BY FRED W. KRIEWELL
Packard Motor Car Company

For deep-hole drilling in metal, it is necessary to raise the drill spindle frequently to remove chips from the flutes, otherwise the chips will pack solidly, bind the drill in the hole and finally twist it off. With mechanical feeds, the downward pressure is positive, there is no safety valve to release the feed if a hard spot is struck which develops increased resistance due to drilling the cutting edges: this condition also causes breakage, because the drill is not strong enough as a column to take the increasing thrust of the feed. Once the mechanical feed is set, the drill is forced ahead regardless of the con-

dition of the workpiece or drill.

To provide a flexible feed which would push the drill constantly into the metal, yet permit resistance to increase if chips bind or a hard spot halts the progress of the drill, a hydraulic feed unit *B* was installed to control this movement, otherwise, the operation is similar to a mechanical feed.

When the drill contacts hard spots or becomes dull, the thrust load increases, building up a pressure in the hydraulic cylinder *C* causing plunger *D* to descend upon lever *E* which kicks off the feed and raises the spindle thereby releasing the load on the drill, preventing it from being broken: this action is repeated until the drill is changed or the part is replaced.



Increased resistance to drilling, due to chips, dull drills or hard spots, builds up hydraulic pressure which causes a plunger to trip the feed lever and back out the drill

The mechanical unit moves the drill into the part to a certain depth, upon reaching this depth the feed is automatically stopped and the spindle raised to allow the chips to be removed. The spindle automatically descends to twice the original boring depth and repeats removal and feed until the full depth of hole is drilled, which means many contacts between plunger *D* and lever *C*.

This method permits deep-hole drilling with few drills being broken. Because of the large number of drill spindles in operation, the unit released several repairmen for other work. The saving in time amounted to over 5000 man-hours a year, in addition to the increased production and the longer service life of the drills. *Suggestion from the Board for Individual Awards, War Production Drive.*

★

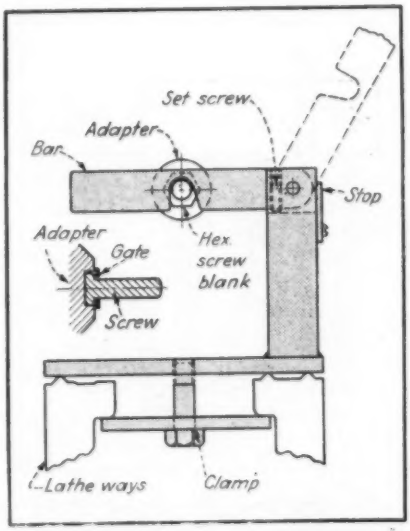
Suggestions appearing on these pages were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive, the Navy Board of Awards to Civil Employees and the War Department Civilian Awards Board. Readers may find these ideas useful in their work.

★

Hinged Gate Permits Loading of Screw Blanks as Lathe Turns

ALBERT E. McKAY
Toolroom Foreman, Novi Equipment Co.

An efficient process has been developed to chase threads on nexagon screw blanks without stopping the headstock. A hex socket for the headstock chuck is made into which the screwhead will slip easily. The illustration shows the gate which clamps to the ways of the lathe, and how it can be adjusted to prevent the screwhead from falling out without bearing on the screw itself. An automatic opening diehead in the tailstock completes the set-up. Between cuts, the operator has only to push the lever, and fit in a new piece when the completed one drops out.

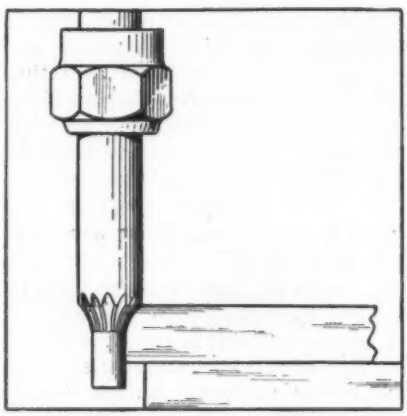


Gate prevents screw from dropping out until die starts cutting; spindle turns continuously

Piloted End Mill Improves Accuracy and Production

BY GEORGE J. OSCARS
Douglas Aircraft Co. Inc., Chicago

Rounding the edges of plates to remove sharp corners is sometimes done by hand through the use of a flexible shaft grinder. Because of the impossibility of exact control of the position of the grinder, accurate results cannot be obtained.



Profiling a rounded edge by the use of a piloted end mill improved finish and accuracy and saved much time

This difficulty was overcome by making a milling tool to cut the radius desired on the edge of the plate, but there will be a pilot to guide against the unfinished edge of the plate.

When the tool is placed in the chuck of a profiling machine, the pilot follows the contour of the article while the edge is being rounded, or a master profile can be made against which the pilot will bear.

This tool has resulted in a decided saving of time and turns out satisfactory work. *Suggestion from the Board for Individual Awards, War Production Drive.*

Contour Saw Chart for Various Materials—I

COURTESY CAPEWELL MANUFACTURING COMPANY

Based on the use of hard-edge flexible metal-cutting band-saw blades; the data can also be used for straight sawing

MATERIALS	TEETH PER IN. SIZE OF MATERIAL				SAW SPEED, FT. PER MIN. SIZE OF MATERIAL			
	1/8"	1/4"	1"	3"	1/8"	1/4".	1"	3"
Aluminum, Pure	14	8	6	6	1400	1200	1000	600
Aluminum, Cast	14	10	8	6	1000	600	400	200
Armor Plate	18	12	10	8	175	125	75	50
Asbestos	32	18	14	6	1400	1000	500	300
Babbitt	14	8	6	4	800	450	300	250
Bakelite	32	32	24	10	1400	1200	800	400
Beryllium Copper	18	12	8	6	400	300	250	200
Brass, Cast	18	14	10	6	1000	400	250	150
Brass, Soft	18	10	8	6	1000	450	325	250
Brass, Navy	14	12	10	6	300	250	225	200
Bronze, Cast	18	14	10	6	800	300	200	150
Bronze, Soft	18	14	8	6	1000	400	300	200
Builders' Board	18	14	12	8	1500	1000	600	200
Carbon Steel	24	14	12	6	300	225	200	150
Cast Iron	18	14	10	6	200	150	100	50
Cast Semi-Steel	18	14	12	8	225	225	200	150
Cast Nickel Iron	18	12	10	6	200	150	100	50
Chromium Steel	18	14	12	8	150	125	100	75
Chrome-Vanadium Steel	18	14	12	8	175	100	75	50
Composition Cork	18	14	10	6	1500	1500	1500	1000
Copper, Soft	18	10	6	6	1200	800	600	200
Dow Metal	14	10	6	4	800	350	250	200
Duralumin, 14St	14	10	8	6	1400	1200	1000	250
Duralumin, 17St	14	8	6	6	1400	1200	1000	250
Fiber	24	18	10	8	1000	600	300	175
Gunite Castings	24	18	12	8	300	175	125	100
Hard Rubber	18	14	10	8	300	200	150	125
High-Speed Steel	24	18	14	8	150	125	100	75
McGill Metal	18	12	8	6	450	300	200	150
Malleable Iron	18	12	10	6	200	175	150	125
Manganese Steel	18	14	12	8	200	175	150	100
Manganese Bronze	18	12	8	6	300	250	225	200
Meehanite Castings	18	10	8	6	150	100	75	50
Mica	24	18	14	10	350	250	200	150
Molybdenum Steel	18	14	12	6	200	125	100	75
Monel Metal	18	12	10	6	200	125	100	50
Neoprene	32	18	14	8	1400	1000	400	300
Nickel Steel	18	14	12	8	200	150	125	100
Nickel—Chromium Steel	18	14	12	8	125	100	75	50
Nickel—Aluminum Bronze	18	12	10	6	500	300	225	200
Nickel	14	8	6	6	150	100	75	50
Nickel Silver	18	14	10	6	300	250	200	100
Phosphor Bronze	18	14	10	6	500	300	200	150
Porcelain	24	18			200	150		
Silver	24	18	14	8	250	250	200	150
Slate	24	18	14	10	300	200	150	100
Stainless Steel	18	12	10	6	100	75	50	50
Swedish Cast Iron	18	12	10	6	200	150	100	75
Tool Steel	24	18	14	8	200	150	125	75
Transite	32	18	14	8	1000	600	400	200
Tungsten Steel	18	14	12	8	200	125	100	75

The width of saw blade determines the minimum radius that can be cut:

Width of Saw	1/8	1/4	3/8	1/2	3/4	1
Min. Radius	1/16	1/8	3/16	5/16	1 7/16	2 1/2

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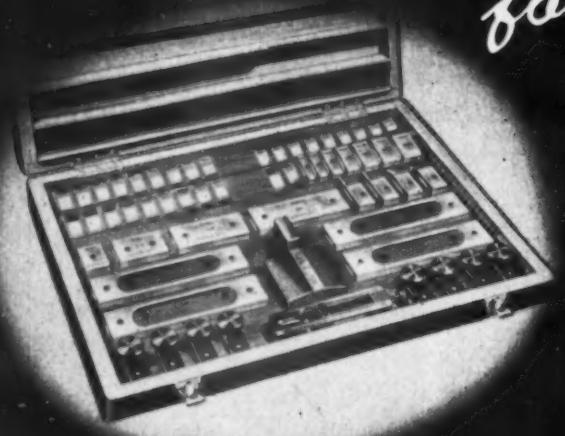

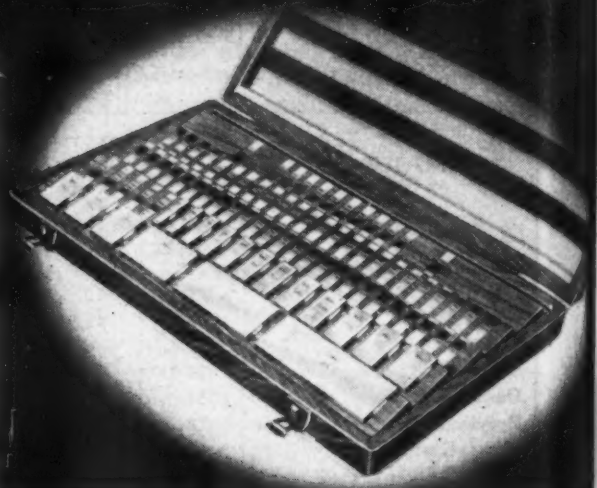

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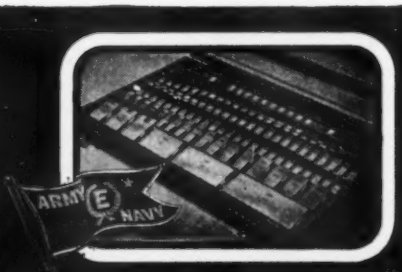

Contour Saw Chart for Various Materials—II

COURTESY CAPEWELL MANUFACTURING COMPANY

Data based on the use of skip-tooth or buttress-tooth saw blades.

MATERIAL	TEETH PER IN. SIZE OF MATERIAL				SAW SPEED, FT. PER MIN. SIZE OF MATERIAL			
	½"	2"	4"	6"	½"	2"	4"	6"
BUILDERS' BOARD								
Celotex	4	3	2	2	4000	4000	4000	4000
Fibrofelt	4	3	3	2	4000	4000	3800	3500
Masonite	6				3800			
Masonite Diestock	6	4	4	3	2000	1500	1200	1000
Masonite Temprtile	6	4	4	3	4500	4000	4000	3500
Kimflex	6	4	4	3	4500	4000	4000	3500
Electrite	6	6	4	3	3500	2700	2000	1800
Temlock	6	4	4	3	4300	3800	3000	3000
Femboard	6	4	4	2	4200	3700	2800	2500
Disfico	6	4	3	3	3400	2600	2000	1800
Termox	6	4	3	3	3400	2600	2000	1800
PLASTICS								
Bakelite	6	4	3	2	4000	3500	3000	2500
Baker Resin	6	4	4	3	4500	4000	3500	3000
Beetle	6	4	3	3	4500	4200	4000	3800
Butacite	6	4	3	2	4500	4200	4000	3800
Butvar	6	4	3	2	4500	4200	4000	3800
Catalin	6	4	3	2	4500	3500	3000	2500
Cibanoid	6	4	3	3	4500	4300	4200	4000
Farlite	6	4	4	3	3500	3000	2700	2500
Fibestos	6	4	3	2	4000	3700	3500	3000
Formica	6	5	4	3	4000	3800	3500	3200
Gemstone	6	4	3	2	4000	3500	3000	2500
Herculoid	6	4	3	2	4000	3700	3500	3000
Insurok	6	4	3	3	4000	3700	3500	3000
Lamicoid	6	4	4	3	4300	4000	3700	3500
Loalin	6	4	4	3	4500	4300	4000	3800
Lustron	6	4	4	3	4500	4300	4000	3800
Lucite	6	4	3	2	3500	3000	2500	2000
Lumarith	6	4	3	2	4000	3700	3500	3000
Marblette	6	4	4	3	4000	3700	3500	3000
Micarta	6	4	4	3	4000	3700	3500	3000
Nixonite	6	4	3	2	4200	3700	3500	3000
Opalon	6	4	3	2	4200	3600	3000	2500
Panelyte	6	4	4	3	4500	4300	4000	3500
Phenolite	6	4	4	3	4500	4300	4000	3500
Plastacele	6	4	3	2	4200	3700	3500	3000
Plaskon	6	4	3	3	4500	4200	4000	3800
Plexiglas	6	4	3	2	3500	3000	2500	2200
Prystal	6	4	3	2	4200	3500	2600	2400
Saflex	6	4	3	2	4500	4300	4000	3800
Styron	6	4	4	3	4500	4300	4000	3800
Tenite	6	4	3	2	4200	3700	3500	3000
Textolite	6	4	4	3	3800	3300	2700	2400
Uformite	6	4	4	3	4700	4500	4200	4000
Vinylite	6	4	3	2	4700	4500	4200	4000
WOODS								
Hardwoods	6	4	4	3	4500	4200	4000	4000
Plywoods	6	4	3	2	4200	4000	3800	3600
Soft Woods	6	4	3	2	4500	4200	4000	4000

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QUALITY CUTTING TOOLS

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Jackson, Michigan

CHICAGO ☆ DETROIT ☆ PHILADELPHIA

Gaging Business

News of Metalworking

$250,000,000 For 1946

There is good reason to believe that next year's machine tool shipments will total about $250,000,000, considerably more than any prewar year. The business is expected to come from: (1) plant expansions; (2) equipment requirements for new products; (3) modernization to reduce manufacturing costs; and (4) export business. Three industries—the automotive, electrical and farm implement—are preparing to spend hundreds of millions of dollars in the next two or three years for production equipment.

Outstanding examples of elaborate reconversion program include the plans of General Motors and Chrysler. The former will spend about $634,000,000 altogether, of which $330,000,000 will go for machinery and equipment, $42,000,000 for tooling, $76,000,000 for reconversion costs. Yet, only about $200,000,000 of this has been spent thus far. Chrysler's program approximates $300,000,000, of which $120,000,000 will go for machine tools and $140,000,000 for other equipment.

Agricultural implement people are busy with expansion programs, too. International Harvester has plans for five new plants, including one at Memphis and another at Wood River, Ill. John Deere is building a new manufacturing plant at Dubuque, Iowa.

Russia Big Market

In the foreign field, Russia and France promise to be the best sources for machine tool orders. As a result of a reported $350,000,000 loan to Russia running for 30 years at 2⅜% interest, the Soviet will take over its outstanding lend-lease orders. The Russians are believed to be preparing a list of machines that they want, and should get whatever was not previously cancelled or diverted to France, Belgium, or UNNRA. But cancelled contracts will not be reinstated.

New direct purchases by Russia will not be made possible by the new loan, but further substantial business is expected if she is granted the large loan of $6,000,000,000 she would like to have.

Incidentally, Russia is reported to have dismantled and moved into her own country German alloy steel and seamless tube mills. Some of the mills are believed to be located at or near Stalingrad. Russia is eager to have available as soon as possible alloy steels for use in a variety of products including airplanes and weapons for her armies.

Tool Output Drops

Machine tool shipments dropped further in September to $27,800,000 from August's level of $32,500,000, and previous monthly average of around $40,000,000. The irregular backlogs in individual companies, shortages of skilled labor, and the decline in new business by some builders accounted for the drop in shipments. Moreover, shipments are expected to remain at current reduced levels for these reasons.

The industry's backlog at the end of September amounted to $199,500,000, as against $217,500,000 at the end of August. But as a result of spotty operations, some builders are booked eight or more months, while others are in need of orders to bolster current schedules. September's cancellations of $9,500,000 following on the heels of August's heavy cuts of $26,200,000 hit some tool builders harder than others. September's new orders dropped to $24,500,000 from August's $29,500,000.

Although makers of special equipment are in the best position, some builders of standard machines report surprising large inquiries.

Steel Schedules Revised

The steel industry's loss of over 600,000 tons of ingot steel from its expected fourth quarter production, as a result of the coal strike, is forcing it to reschedule unfilled orders. This means that customers will either not get the expected steel as soon as had been promised some time ago, or will get part of it on the expected delivery dates. The fact that steel producers are taking losses on certain products may mean that this will also influence changed production schedules.

This is a further intangible upsetment of the nation's reconversion schedules and will reduce expected production of various civilian goods by many thousands of units for the current quarter. Meanwhile industry still has no assurance against new labor disturbances in the light of unsettled wage-price policies..

Clayton Formula Change

The Clayton formula for surplus tool prices may be changed to take into consideration different price levels for jobbers, wholesalers, builders, and users. Some official opinion in RFC still seems to oppose dealers' commissions.

In addition, changes are in the offing for the Clayton formula at least to take into account the relative hours of use of each machine, which the present deductions do not permit. A machine which has been on three shifts has had three times the depreciation of one of equal age that has been on only one shift. At the same time, the three-shift machine has probably lacked adequate maintenance.

Auto Frame Conveyor—Shown nearing completion is this quarter-mile automobile frame conveyor, being constructed as part of Studebaker's $16,000,000 reconversion and expansion program. The system will permit direct delivery of frames from docks to the head of the assembly lines

Buyers' Criticisms Forcing Changes in RFC Surplus Disposal Procedures

WASHINGTON—Buyers' complaints and official difficulties with existing RFC surplus property practices indicate that numerous revisions in the disposal program are imminent.

One major problem has been the time lag in monthly inventories of RFC district offices indicating declared surpluses. Sometimes, the equipment has already been sold by the time that potential purchasers are able to see the listings, or by the time they are received by other regional offices. This condition prevails even though there are teletype connections between RFC regional offices, and such communications could be used to make sales notifications to other regional offices.

Management Lacking

It is reported that one reason for this condition stems from the poor calibre of managements in some regions where such individuals are political appointees. At the same time, low salaries for such jobs prevent the hiring of more competent help. In one case, a district manager wired Washington for information on whereabouts of certain machines listed in AMERICAN MACHINIST's 1945 Inventory, although he had property lists in his possession which could have given him the answer. However, occurrences such as these have tended to direct more and more inquiries by buyers to Washington.

Opinion is divided over whether the system should be centralized in Washington with all the records concentrated there, or whether it should be overhauled with better management and kept on a regional basis. However, it is agreed that weekly property listings would be a big improvement over current monthly lists, although this would require more personnel and additional facilities.

Critics of the present system say it is inadequate for the magnitude of the job, and should be improved now to help reconversion and employment.

Preferences Attached

RFC officials say that SWPC's preferences on surplus are not helping veterans much and are obstructing progress. One official estimated that SWPC can only handle about 5% of surplus, but it is delaying the other 95%. Unconfirmed reports say that SWPC favors veteran borrowers over those with cash, to show much business on its books (both loans and surplus sales).

There is some controversy over whether or not preferences for veterans helps employment more than if big concerns were aided to reconvert faster and put more people to work. Even so, few officials want to withhold any equipment from veterans or small operators who need it. Certainly, it would be difficult to change the system with fairness to all.

Criticism has been aimed at RFC's advertising of scarce surplus items, such as press brakes, squaring shears, and mechanical and hydraulic presses, when RFC may only have one or two such items for sale. However, RFC contends that the law provides for such advertising, and to avoid it might bring charges of sales discrimination.

GE DIVISIONS REORGANIZED

SCHENECTADY—The Motor Division of General Electric's Apparatus Department has been reorganized. Now segregated into a natural arrangement of operating units, the division now contains four divisions and one section.

W. H. Henry, formerly manager of the Motor Division, has been appointed manager of the Industrial Divisions in charge of the motor business. The following division managers have been appointed: A. W. Bartling, manager of fractional-hp. motor division; Elliot Harrington, manager induction motor division; J. T. Farrell, manager D-C motor division; and P. A. McTerney, manager synchronous, large D-C and gear-motor division.

600,000 Tons of Steel Lost in Coal Strike; Fourth Quarter Schedules Cut

PITTSBURGH—Although the steel industry is busy trying to make up the production losses suffered during the coal strike, it is generally acknowledged that this will take a long time. The strike cost American industry about 600,000 tons of steel ingots, thus disorganizing the steel industry's production schedules for the balance of 1945 and early 1946. Moreover, the industry's low coal stocks are expected to cause more production losses during any unseasonable winter weather.

Steel mills will be unable to build up coal stocks to safer levels, because manpower is short at the mines and coal consumption at coke plants is too high. During the three-week coal strike, one of the largest coke plants in Pittsburgh was forced to curtail its operations by 25%, because its coal supply had fallen to two-days' requirements from the normal 12-days' supply usually kept on hand. The coal strike resulted over the foremen's attempts to unionize.

More Labor Trouble?

Labor relations may afford the industry further difficulties. Negotiations are underway on the steel workers' wage demands, which U. S. Steel had already declared it will be unable to meet unless steel prices are increased by at least $7 a ton. The company stated that it was losing money on most of its shipments. However, indications point to further discussions. Some observers believe "flash" strikes may occur during the talks. It is believed that the controversy may eventually be settled with a 15% wage boost, but few expect that there will be no further production losses.

Demand for steel remains strong in practically all products, which is not surprising since deliveries have been delayed and higher prices are in the offing. Fortunately for the industry, greatest demand has been in the light-, flat-rolled items, which are also the most profitable, and thus during the coal strike available ingots were shunted to these mills. Some heavy items were in reduced or entirely interrupted production. Mill stocks of slabs and ingots were used up partly, and that is why resumed steel operations was not immediately accompanied by stepped up finishing mill schedules.

New Schedules

But now schedules have to be laid out all over again, and steel shipments, which had been allocated for the quarter, will have to be reallocated. This means smaller tonnages than most users had earlier been promised, but all consumers are still pressing for more and more still.

Despite these problems, the industry is changing its delivery price method. Basing points are being extended, originally starting with stainless steel, but now spreading to alloy and carbon steels. In the end, most mills may become basing points, which would be favorable to consumers, on the whole. However, from the mill standpoint, more freight will have to be absorbed under this new arrangement.

Meanwhile, the OPA is making no move to come out with new steel prices, although increases are reported to have been approved and are being held in readiness.

Detroit Letter

Hope For Labor Peace

With strike votes going on throughout the automobile industry, the automobile manufacturers are nevertheless going ahead with plans to reach pre-war production peaks by next Spring. By next September, schedules call for new heights. General Motors, for example, has its sights set on 15,000 vehicles per day by that date.

This to observers is an indication that the car builders see hope somewhere along the line for a more or less permanent labor settlement.

The strike votes being taken currently among the Big Three are a waste of money, all parties to it agree.

Further Discussions Seen

Feeling in the industry is that a settlement will be reached between management and labor before any strike is called at this time. Walter Reuther, leading spirit in the demands on General Motors, has adopted a more conciliatory attitude and has ventured compromise ideas. That most of them are unacceptable to GM management does not mean rejection by the latter. It means more talks and counter-proposals.

C. E. Wilson, at a recent press conference, said the company had given a flat "No" to the 30 per cent wage boost demand. But he left the door open on the matter by adding "without a revision of the pricing formula." The attack is on this end and chances are that the car makers will get some relief, if not all they are asking.

Production Rising

The production outlook is bright, if some assurance of even flow of materials and parts can be assured. Right now, the companies are stepping along in fair shape. Of the producers now in action, only Packard was being held up by shortages which prevented final assembly of cars.

A survey showed that Buick was producing at the rate of about 100 cars a day and is stepping up to 200 a day. The November schedule calls for 10,000 or about 500 a day. The division will reach the peak of 1,800 cars a day by next March.

Cadillac is getting out 50 cars a day and is expecting to raise their sights to 320 a day by next March. Nicholas Dreystadt said this year's output of Cadillacs will be 5,000 and in the first full year the division will send out 60,000.

More Pontiacs, Chevrolets

Pontiac is assembling 300 a day, expects to double this in November and triple it in December. By next February, it expects to make 1,800 a day, its pre-war peak.

Chevrolet, from which little has been heard on passenger car production, is turning out about 400 cars a day. Its October schedule called for 9,591 passenger cars. In November it expects to make 19,000 and 40,000 in December. The truck schedule, in addition, is 23,000 in October, 41,000 in November and 44,000 in December.

More Trucks, Too

The division has been busy on civilian trucks this year and its total production for the year will be 238,960 cars and trucks. It already has some of its assembly plants in operation such as St. Louis, Kansas City, Norwood and Cincinnati. While pre-war Chevrolet had a capacity of 6,000 cars and trucks a day, its plans call for stepping this up to 6,800 passenger cars and 2,300 trucks per day. It expects to exceed a 2,000,000 car year by next October.

The independents too are stepping up output as rapidly as possible. Nash will make about 10,000 cars this year and Hudson about the same. Packard with an assembly line just completed but plagued by body shortages, expects to make 8,000.

Ford is producing 400 cars and 400 trucks a day but is stepping up rapidly. It aims for 50,000 cars and 25,000 trucks this year. Its cars have gone on public showing and response to the new line has been good, according to Jack Davis, general sales manager.

CLEVELAND PNEUMATIC TOOL BOUGHT BY SCHOTT

CLEVELAND—The Schott interests have purchased the Cleveland Pneumatic Co., including its main plant and Toronto plant, for $4,150,000. The Company recently formally returned to DPC its Aerol unit.

Chrysler is lagging behind the parade. Its plants are still in the process of reconversion, with machine tools moving out and others moving in. K. T. Keller expects some production in January but does not expect to reach any substantial output until March.

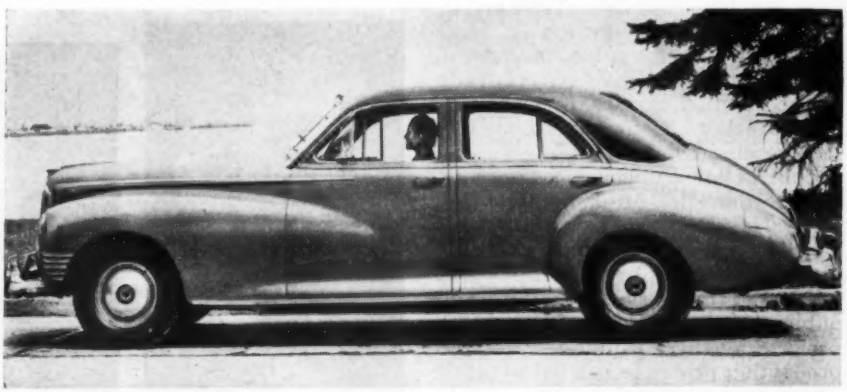
Presses Short

Lack of machine tools is playing very little part in mounting production. Packard said it needed only about 5 per cent to be back at peak. It has bought many specials from the government and set back in place 80 per cent of its old machines.

What it needs most, however, is presses. It is getting its bodies from Murray now and some day hopes to get back into its body building activities. For this it needs 200 new presses.

Jack & Heintz Car?

A new competitor has announced intentions of entering the automotive field. This is Jack & Heintz, Inc., of Cleveland. The company is being reorganized and expects to have $50,000,000 for "new and revolutionary products." William S. Jack, president, has stated that "Jahco automobiles will be rolling off the assembly lines in 1947." He revealed a new type of engine, which in laboratory tests ran the equivalent of a non-stop trip around the world at 75 miles an hour.



New Packard Touring Sedan—The new Packard Clipper incorporates 68 design and mechanical changes. Exterior changes include a new styled radiator grille, and more massive sideguard bumpers. Interior features include new steering gears, precision long-life bearings, and oil-control piston rings

N.M.T.B.A. Discusses Jobs, Export Markets, Surplus Tools

Trecker declares increased productivity is major employment factor. Discount to dealers and builders suggested by Kirk to speed surplus tool disposal. Keller outlines foreign markets. William P. Kirk elected president of Association

CHICAGO—The theme that "more goods for more people at lower prices means more jobs" was dominant at the forty-fourth annual meeting of the National Machine Tool Builders' Association at the Edgewater Beach Hotel October 22-23. Job incentives, accelerated depreciation rates for new equipment, foreign sales, public relations, efficient handling of surpluses, and conditions in Germany were among the topics presented to the convention delegates. George Johnson's address on the German machine tool situation was an outstanding feature of the meeting. Mr. Johnson is a member of the U.S. Reparations Commission and is president of the Gisholt Machine Co. An abstract of his address is published on page 132f.

Productivity Is Job Key

Employment can be increased only in proportion to productivity, declared Joseph L. Trecker, executive vice president Kearney & Trecker Corp., in his address as president of the association. Productivity can be increased only by greater utilization of machines that enable the worker to multiply his own output. The pay that the worker gets should be related to his production rather than to the time clock. In addition, taxation policies should be revised so that there will be an incentive, instead of a penalty, for installation of equipment that will lead to greater productivity. It is the responsibility of the machine tool industry and of each machine tool builder, said Mr. Trecker, to broadcast this ideology.

If history is any guide, the operation of the competitive system leads to the creation of jobs, according to Mr. Trecker. Competition creates jobs because competition offers more people better things at lower cost. This is done by utilizing the principle of maximum productivity whereby machines and men become partners in mutiplying output. The failure of industry to educate the public to an understanding of the basic economics behind the volume production principle has led to much of the present social unrest.

Insofar as a company, by the aid of good machine tools and other productive equipment, can cut the cost of its product, it can offer that product at a lower price. As the price goes down, its potential market increases. As its market increases, its volume goes up. As its volume goes up, it can hire more men. That is how more jobs are created, outlined Mr. Trecker.

The idea now is that a man should turn out only as much work per hour as is permitted by his shop steward. Labor's idea is that by limiting productivity more jobs can be maintained. Industry's idea is that by increasing productivity, not only can more jobs be maintained but additional jobs can be created.

Russia Uses Principle

"It is certainly a paradox," said Mr. Trecker, "when Russia, under a system of regimentation, accepts and utilizes the principle of maximum productivity, while in America, where the whole preservation of our social economy depends upon the acceptance of that principle, organized labor is proceeding in exactly the opposite direction."

Mr. Trecker declared that "the man who does not produce on his job is no more entitled to job security than is the company that fails to produce a better product at a lower price, entitled to economic survival." Industry cannot guar-

New Officers of National Machine Tool Builders' Association

President

WILLIAM P. KIRK
v. pres. Pratt & Whitney Division Niles-Bement-Pond

1st Vice President

HERBERT H. PEASE
pres., New Britain-Gridley Machine Co.

2nd Vice President

A. G. BRYANT
pres., Cleereman Machine Co.

Treasurer

RICHARD E. LeBLOND
pres., The R. K. LeBlond Machine Tool Co.

Director

FRED W. McINTYRE
pres., Reed-Prentice Corp.

Director

WILLIAM L. DOLLE
pres. & gen. mgr., The Lodge & Shipley Machine Tool Co.

antee job security to anybody; but industry can teach the principle that productivity is the key to steady employment.

Speeding Surplus Disposal

Two basic requirements, speed and the setting aside of adequate tools for a war emergency, are essential in handling our surplus machine tool problem, stated William P. Kirk, vice president Pratt & Whitney, Division Niles-Bement-Pond Co. and chairman of RFC subcommittee of the association. Mr. Kirk made a number of recommendations to expedite the sale of surplus machines. For one thing, every effort should be made to simplify procedure so that any buyer can go to any RFC warehouse, make his payment, and haul the machine away. Moreover, a resale discount to recognized manufacturers and dealers would be of assistance. A regulation is now being written to permit resale through dealers and builders at a discount, probably some 15%. In addition, an extension of the Clayton formula to machines 15 years old or less is being considered.

Mr. Kirk insisted that machine tool builders should be permitted to purchase their own machines at negotiated prices that will enable them to rebuild and resell the machines. He said that no surplus tools should be shipped out of the country unless they have first been checked, cleaned, inspected and approved, and if necessary rebuilt, by the original manufacturer. It also is in the national interest that any reputable educational institution not operated for profit be allowed to secure machines and laboratory equipment at the cost of boxing and freight to the school. He likewise urged that machines over 15 years old in the government surplus be scrapped, an additional discount from the Clayton formula being offered the buyer of a war surplus machine for such scrapping.

Foreign Markets Huge

During the next few years foreign sales of machine tools may well have the importance to the industry that they had in the thirties, said Alexander S. Keller, vice president Pratt & Whitney Division, Niles-Bement-Pond Co. and chairman of the association's foreign sales committee, in an address on "Selling Abroad." He pointed out that the industry will not be faced with the condition of the last postwar period when Germany used every possible means to secure foreign exchange by dumping her goods abroad.

Thus far no foreign purchasing mission is interested in acquiring used or surplus tools, said Mr. Keller. Their experience with surplus machines after the last war was bad; they also feel that they can get their reconstruction programs under way in the least time if they select the new machines they want. Mr. Keller called attention to the part of the FEA and WPB in trying to cushion the industry against effects of cancellations of Russian lend-lease orders. The result was a long delay that discouraged the French and Belgians from placing orders. It left the Russians at so complete a loss as to what they could expect as to give them every reason for the delays that have brought new Russian business almost to a standstill.

No Priorities On Exports

Mr. Keller said that the functions of FEA in which the machine tool industry is interested have been turned over to the Department of Commerce. Machine tools can now be shipped without priorities and on general license to every foreign country except Argentina, Italy, Spain, Germany, Japan and a few others of minor importance.

Latin American countries will not be industrialized as we know industrialization within our lifetime, said Mr. Keller, but they are anxious for American products and for American technical assistance, and they have the money to pay for both. Sweden, Switzerland and Portugal seem ready to go ahead on a basis of direct private business with U. S. builders. Machine tools are being acquired by UNRRA for Czechoslovakia, Yugoslavia, Greece and Poland. Thus far activities have been limited, however, to filling a few requisitions out of the Russian lend-lease pool. Later UNRRA may place new machine orders through the procurement department of the Treasury under mechanics similar to lend-lease. The Chinese program must await establishment of new credit arrangements.

British Trade Problems

The larger part of purchases by France, Beligum and the Netherlands will be financed through intergovernmental loans which, in the case of France, have been tentatively arranged. Belgium is unique in that it has a substantial credit balance on lend-lease account. In dealing with British business, builders are faced with many difficulties, including the necessity that agents in Britain secure import licenses which are granted only grudgingly after it has been established that no machine tool of British manufacture can be substituted. In addition, Britain has returned to a protective tariff on machine tools. In Australia U.S. builders are up against two tariffs: one an Empire preference duty of 15 percent, and the other a protective tariff of 65 percent assessed against any machine which theoretically has a competitor produced by the new Australian machine tool industry.

The Russians are bound to be one of the largest foreign customers of the U.S. machine tool industry, according to Mr. Keller. Monopoly purchasing undoubtedly will be continued by the Russians.

If this country is to have full employment, it must put to work a large portion of the surplus tools that were used during the war, said John S. Chafee, director equipment bureau WPB, in a farewell talk upon the eve of leaving office. He thanked the industry for its cooperation during the war period.

Emergency Tool Reserve

The Army and Navy must immediately take vigorous action to set up an adequate reserve of machine tools against the possibility of another war, said James Y. Scott, president Van Norman Co. and chairman of the association's committee on government relations. He urged every builder to get in touch with his Congressman right away on this matter, commenting that the finest arsenal in the world already is being dissipated under our eyes.

William L. Dolle, president Lodge & Shipley Machine Tool Co. and chairman of the committee on color standards, reported the unanimous opinion of the committee that the industry should return as soon as possible to the standard machine tool gray. Even the large automobile companies have agreed with this.

Louis Polk, president Sheffield Corp. and chairman of the committee on advertising and public relations, presented a public relations program for the industry, recommending particularly that every builder do a job of trying to educate the citizens of his own community about the great importance of productivity and of a combination of men and machines in creating jobs.

L. D. McDonald, vice president Warner & Swasey Co. and chairman of the committee on fiscal problems, discussed taxes and profits in a prepared address. Phil Huber, president Ex-Cell-O Corp. and chairman of the OPA machine tool advisory committee, outlined to the members efforts to secure removal of the price ceiling on machine tools.

Harry Crump, Carboloy Co. and Reed Andress, vice president Barnes Drill Co., participated in the symposium on conditions in Europe which was introduced by Mr. Johnson's address. Mr. Crump and Mr. Andress were in Germany for the Technical Industrial Intelligence Committee.

Decentralization, Quick Depreciation Aided German Industry

BY GEORGE H. JOHNSON
PRESIDENT, GISHOLT MACHINE COMPANY

From a speech delivered before the 44th Annual Meeting of the National Machine Tool Builders' Association, Edgewater Beach Hotel, Chicago, Ill. October 23, 1945.

When the war ended, Germany, in spite of all of the bombing of its industrial plants, still had left, in repairable condition, probably more machine tools than we at this moment have in the entire United States of America.

And when I say machine tools, I mean modern and new machine tools. German machine tools are good. I won't say that on the average they are quite as good as American-built machine tools. But the Germans have succeeded in copying and practically making replicas of many of the finest of America's machine-tool models. I saw, for instance, good copies of the Bullard Multaumatics built by Magdeburg, and good copies of much of the Gleason line by Heidenreich & Harbeck, as well as many others.

Nazi Tool Aspects

On the average, German machine tools don't possess quite the degree of productivity possessed by American makes; but on the other hand, in a number of plants we saw certain types of special machines which represented technological advances in certain directions which were ahead of those thus far developed in this country.

You may be amazed at the proportion of the German industrial machines that remain operative and undamaged in spite of all the air raids. We estimate not over 15% were damaged beyond reasonably simple repair, although air-raid damage was enormous. The reason is Germany had integrated its manufacturing operations and worked out a tremendous system of industrial cooperation based upon the principle of decentralization.

Wide Decentralization

You can practically lay it down as a principle that in Germany not all of any one product was ever made in any one plant. There was no one plant which represented a key to the whole structure. If one plant was bombed out, there were other plants doing the same thing that kept on going.

Decentralization of production was accomplished by a system of small plants, and the setting up of individual machines in garages and even in private homes. All that was needed was a roof, an operator, and electric power—and there you had a production unit. The result was that there were literally thousands of tiny production units scattered all over the countryside. Nothing but complete annihilation of every building in Germany could have knocked out Germany's industrial capacity—and even this would not have done a total job. For, in addition to everything else, the Germans had underground plants; they had duplicate stand-by plants; they had specially-protected plants. And furthermore, their entire industrial system was linked up by an interlocking system of electric power.

George H. Johnson

Mr. Johnson recently returned from Europe as a member of the U. S. Reparations Commission, headed by Mr. Edward S. Pauley

German Tools Survived

The fact is we didn't destroy Germany's productive capacity. In fact, as we saw the records, the output of many types of war materiel kept on going uphill right to the moment of the defeat of Germany.

Germany may have been licked by shutting off its petroleum supplies, by its own lack of manpower, by the excellence of our fighting machine, by accelerating its difficulties as to raw materials—but Germany was not licked by knocking out its machine tools.

In studying further into this picture we were amazed to find that, with few exceptions, Germany didn't use the multiple-shift principle of production. They worked their plants one long 12-hour shift a day, seven days a week.

Germany had far more good and new machines in proportion to its output, in proportion to its population, and in proportion to the size and scope of its plants than we had in this country. And even in the face of the most severe aspects of threat of defeat, Germany operated its machine tools one shift a day while we were running ours around the clock.

What was the answer? Why this difference?

The basic difference lay in the German Government's policy with respect to taxation and depreciation schedules—as contrasted to the policy of our Government in the United States.

Depreciation Policies

In this country it has long been established Government policy to try to impose upon industry a low depreciation rate with respect to the writing off of industrial equipment. The lower the depreciation rate allowed, the higher is the current taxable income of a company.

To put it another way—the United States has not permitted the manufacturer to recover the cost of productive equipment from the price received from the sale of its product except upon a slow and tardy basis. Such depreciation schedules average, I am told, about 20 years. Any attempt at accelerated write-offs has resulted customarily in disallowances and tax penalties, unless the manufacturer had past records and actual experience in accelerated write-offs.

There were some exceptions to this tax principle during the war, when 5-year write-offs were permitted, as you know, under certain circumstances. But these were the exceptions and not the rule.

A.S.T.E. Exposition To Be Held in Cleveland April 8-12

DETROIT — The American Society of Tool Engineers Exposition will be held in Cleveland from April 8-12 inclusive, according to an announcement by the A.S.T.E. Board of Directors. This will be the first post-war show featuring machine tools, material handling and control equipment, cutting tools and production processes, and it is expected that it will require the entire 250,000 sq. ft. of space in the Cleveland Public Auditorium.

The Annual Meeting of the A.S.T.E. will be held in conjunction with the show and a series of technical sessions will be scheduled. The floor plan of exhibit space may be obtained from A.S.T.E. headquarters, Penobscot Building, Detroit 26, Mich. C. V. Briner is president.

Washington Bulletin

Lend-lease Order Status

Status of cash orders from Russia, France, Belgium, South American and other countries for machine tools, following termination of lend-lease, is completely clouded. Dozens of officials in the State Department, Commerce Department, and what's left of the Foreign Ecoomic Administration, claim to know nothing about it. They don't know how much equipment was completed and ready for shipment at American plants, how much was en route, or how much was delivered after the lend-lease deadline — without purchase orders. Nor do they know what plans are being considered by the foreign countries to continue their purchases for cash. The Soviet Purchasing Commission, with its customary indignant evasions, seems barely aware of the cash orders; French and Belgian commissions have no immediate information. Whether the Washington agencies really don't know, or whether they don't want to talk, it seems likely that some members of Congress will want to know why.

Emphasis On Research

Wright Field's supercollosal "Air Fair" was staged to convince the public and Congress that security of the United States will require a continuous and expensive research program. The demonstration seemed ill-timed, Congress being engaged in hearings on numerous bills to create a national research organization which would not include the Army's Wright Field laboratory. Officers at Dayton say that their Public Relations Department had not flown the right congressmen to their display. A further limitation on effect of the fair was that only people of Dayton, some travelers, and such guests as the Army could bring, were able to see it. Several cities offered to pay transportation if the huge circus were lent to them. Practically everything the Army Air Force used in the war.

Guided Missiles

Most impressive unpublicized items were the guided missiles, which many authorities have said will devastate the world in the next war unless their production can be stopped by agreement or otherwise. Television camera-transmitter in the nose of the bomb gives the pilot, in the plane that dropped it, a view as if he were going down in the nose of the bomb himself. Through radio control of airfoils on the bombs, he guides them into the target. Some have small wings and can be glided over long distances. Long-range jet and rocket powered missiles, rather inaccurately aimed at this time, eventually will have electronic control. All can carry atomic bombs.

The fair showed an experimental 46-cylinder 5,000 hp. radial aircraft engine by Lycoming, General Electric's superjet P-80 engine, a 42-cylinder Wright liquid-cooled engine rated at 2,500 hp., a 16-cylinder 2,500 hp. unit by Chrysler, two Allisons geared with long shafts to two counter-rotating co-axial propellers —for internal installation.

Federal Research Laws

Hearings on the Magnuson and Kilgore bills to create a Federal Research Foundation are scheduled through Nov. 2. Kilgore's proposal that U. S. research be coordinated by an administrator seems to prevail over Magnuson's provision for a nine-man board. Magnuson leaves ownership of patents developed under the program, to the board's discretion, while Kilgore would make such discoveries available to the government.

The Senate Military Affairs Subcommittee is nearing an agreement on an appeals procedure to settle patent disputes. Magnuson would employ general-purpose funds and contracts, while Kilgore would provide for specific research contracts only. Fears are expressed lest science lag under bureaucracy, and that the government tend to control resulting industries. Whether Magnuson's board can be non-political as he intends, is questionable.

Whatever the federal research setup may be, established agencies like the Bureau of Standards, National Academy of Arts and Sciences, Weather Bureau, Coast and Geodetic Survey, and National Advisory Committee for Aeronautics, plus college and military laboratories, will be coordinated and drawn upon for the actual achievements.

Standby Tool Problems

Due to rapid obsolescense and design progress in weapons and production methods and facilities, the armed services are greatly troubled in their selection of tools for standby plants. These difficulties are pronounced in aircraft. One recommendation in this dilemma is that special tools are hardly worth keeping: that general-purpose tools be reserved in large quantity, allowing enough to start large production in emergency, plus enough to make the special tools. A similar program was recently adopted at the Army's Wright Field aircraft design and procurement headquarters.

British Auto Industry Gets Export Jump On U. S. Builders—British auto plants have been able to reconvert somewhat faster than American plants, and cars are already being turned out for the export market. Here, the body of an Austin is being lowered into place on a British assembly line

Strikes Decline, But Major Labor Issues Are Unsettled

Government is caught between industry's demand for higher prices to permit wage increases and labor's demand for higher wages without price increases. Congress talking back to unions, partly as a result of too many strikes

NEW YORK—Declining strike idleness in the nation's industrial plants during late October gave reconversion-minded management men an opportunity to sit back and assess their labor relations. Generally, they found little reason for optimism, although a wave of major work stoppages had been ended and the number of men idle in strikes was down 50 percent.

Fundamentally, the situation was this: strikes had been ended, but not settled. The major issues behind them—such as the demand for sustained take-home pay with the elimination of overtime hours now worked, or the demand for recognition of foremen for collective bargaining purposes—remained just as alive as in the heat of strike action.

This is due, in large measure, to confusion existing on federal wage-price policy. Management, generally, has been reluctant to negotiate substantial wage raises as long as doubt existed on what—if any—relief could be expected from price ceilings which were based upon lower costs. Labor has contended that no price increases would be necessary in most industries to bring wages up as much as 30 per cent over present levels.

Thus official Washington has been caught between two fires: industry demands for price increases to make possible wage readjustments, and labor demands that prices continue unchanged while wages move up substantially.

Wage-Price Formula

The tug-of-war was reflected in extended conferences between President Truman and his labor, industry, and stabilization advisors regarding a settlement of wage-price controversies. With impatience growing, a formula was devised by the presidential conferees, to be submitted to the Labor-Management Conference started Nov. 5.

Details—which might be forced out into the open before that time—center around an official belief that wage increases of about 15 percent are "reasonable" and can be met by industry with only a slight paring of profits.

Government officials figure companies can pay 10 percent more without impairing their financial positions because of current savings from elimination of overtime, and greater productivity of employees through the wartime technological advances in industry; while their profits would stand another 5 per cent pay hike because taxes are being revised downward.

Growing belief is that the Labor-Management Conference might find in its hands something it had not bargained for — the necessity of working on wage policy, dynamite in any meeting of the men who pay and the men who receive wages.

Strike Threat Grows

Meanwhile, negotiations faltered along on wage issues. U. S. Steel Corp., for instance, refused demands of the United Steelworkers of America (C.I.O.) for $2 a day more pay; railroads received demands for 25 per cent more, and other demands were accumulating. Worst threat, outside the automotive industry, seemed to be in steel, where talk is growing of a strike vote of 500,000 basic steel workers and 400,000 in the fabricating and processing industries.

The broad outlook was for more—and not less—trouble in the months ahead.

When the current relaxed situation will end is a matter for speculation only. Informed sources are confident that, for example, there will be no major strikes in the automotive industry before early 1946. But in taking that view they presuppose that the United Automobile Workers (C.I.O.) will be able to control memberships in the automobile companies far more successfully than they exercised discipline over local unions in the parts suppliers' plants. The difficulty is that once a flash strike starts in any one of the automotive plants, U.A.W.'s best strategy may be thrown out of kilter.

That strategy, officially enunciated, is to hold off any strike action against the Big Three until they are actually producing—and distributing—their new models, and then to strike the companies one at a time. General Motors apparently is slated to be the first, and contract negotiations—in bitter stalemate—now are concentrated there.

Auto Tie-up Doubtful

Strike votes taken by the National Labor Relations Board in G.M., Chrysler, and Ford plants now have complied with the Connally-Smith War Labor Disputes Act, and U.A.W. workers are free to go out, on strike call, whenever their leadership chooses. That could be today, or tomorrow, but probably won't be.

Union leaders, interested in getting the best deal possible at President Truman's Labor-Management Conference, are inclined to hold back on the militance of strike action until the conference runs through its two to three weeks of deliberations on a new industrial peace program, or until the conference discussions obviously are headed down a blind alley and need a strong jog

Lack of Strike Policy Prolongs Nation's Labor Headaches—This injured nonstriker, victim of a West Coast jurisdictional dispute between two AFL unions, is symbolical of the nation's inability to cope with its past and prospective labor troubles. Worried by looming strikes in the auto and steel industries, some officials are seeking means to protect the public against difficulties and inconveniences caused by strikes

to get them back into constructive paths.

Strikes just before the conference opens, or while it is in progress, might conceivably scuttle the discussions, labor realizes, and thus clear the way for a federal legislative program—possibly along the lines of the recent Ball-Burton-Hatch labor control proposals—in which labor had no planning role.

Labor Opposes Controls

Consequently, the word is going down the union line to stay on the job, to negotiate on new contracts without giving ground, to hold tempers—for a little while longer.

But it will not be easy for Chief Justice Walter P. Stacy of the North Carolina State Supreme Court to keep the meetings moving smoothly and constructively, despite realization by both labor and management of the chaos that might come from an unsuccessful conference.

Meanwhile, federal labor agencies have been dwindling in importance, the National Labor Relations Board because its work of administering the National Labor Relations (Wagner) Act has been choked down by the necessity of taking Connally-Smith strike votes, and the National War Labor Board because—with its powers for enforcement now almost non-existent—it has voted to go out of existence by Jan. 1, 1946, or two weeks earlier if possible.

NLRB's troubles are typified by the situation in Detroit, where the board was called upon to conduct 42 strike votes involving some 600,000 workers in a matter of weeks. The G.M., Chrysler and Ford polls were the largest, and cost more than $100,000 of NLRB's dwindling funds. Other votes ranging upward from a few hundred to 10,000 workers each helped fill up the time of board workers to such an extent that the work for which NLRB was created went untouched.

NWLB to End

The danger is that as long as this bottleneck exists, labor dissatisfactions and grievances are piling up. New strike causes are being created.

Realizing this, congressional attention is being turned on the Connally-Smith Act, particularly that provision calling for strike votes which almost inevitably result in approval of union walkout plans.

NWLB's decision to wind up its work through "orderly liquidation" has led to the formulation of a new policy. Henceforth, the board will act on new cases only to the extent of naming an arbitrator or arbitrators to decide issues involved. It will not hear the merits of any new cases, issue orders or directives in them, or review arbitration findings. Cases which were filed prior to Oct. 22 will continue to be processed on the former basis.

The board's designation of Jan. 1, 1946, or Dec. 15, 1945, as its date of termination puts the pressure on for fast Labor-Management Conference action to set up new peacetime machinery for handling reconversion labor disputes.

Congress Talks Back

Elsewhere on the labor front in Washington, unions were exerting strong efforts to overcome resistance to President Truman's program, including a full employment bill, increased unemployment compensation, 65c.-an-hour minimum pay, and tax relief for the lower-bracket taxpayers. But unions were showing little progress toward any legislative objective. Instead, congressional sentiment stirred by grass-roots reaction against strikes, and soaring unemployment compensation rolls while many jobs went begging, was talking back to labor delegations to Washington, calling for extension of controls and not further benefits for labor.

Dr. W. F. Hess Is Welding Society's New President; Bibber Wins Lincoln Medal

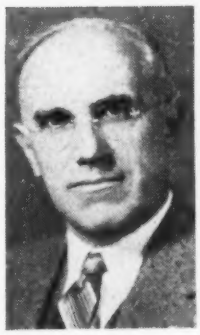
NEW YORK—At its Annual Meeting here, the American Welding Society presented its Lincoln Gold Medal to Leon C. Bibber, welding engineer, Carnegie-Illinois Steel Corp., as author of a paper adjudged to be the greatest original contribution to the advancement of welding. Mr. Bibber's paper, "Tensile Properties of Heavy Longitudinally Welded Plate Specimens Simulating Deck and Shell Joints," was based upon experiments at the American Bridge Company's Ambridge, Pa., plant, where plates 1¼ inches thick and weighing as much as three tons were subjected to tensile tests. The Lincoln Medal is donated by Mr. J. F. Lincoln, president, Lincoln Electric Company, Cleveland, Ohio.

Wendell F. Hess

Leon C. Bibber

At the meeting, Dr. Wendell F. Hess, Professor of Metallurgical Engineering and Head of the Welding Laboratory, Rensselaer Polytechnic Institute, Troy, N. Y., assumed the office of presidency for the 1945-46 year. Dr. Hess was awarded the Lincoln Gold Medal in 1944, received the University Award of the Resistance Welder Manufacturers Association, and in July, 1945, was awarded the American Iron & Steel Institute Medal for 1944.

The new First Vice-President for the Society is Mr. Harold O. Hill, assistant chief engineer, fabricated steel construction, Bethlehem Steel Company; while Mr. George N. Seiger, president and general manager of S-M-S Corporation, Detroit, Michigan, has been elected Second Vice-President. Directors at Large, elected for three-year terms, included: Charles H. Jennings, section engineer, Welding Section, Westinghouse Research Laboratories, East Pittsburgh, Pa.; R. D. Thomas, president, Arcos Corp., Philadelphia, Pa.; A. B. Kinzel, vice-president, Electro Metallurgical Co. and Union Carbide & Carbon Research Yaboratories; and C. M. Underwood, manager, Weldment Department, Northern Ordnance Incorporated, Minneapolis, Minn.



George N. Seiger

Harold O. Hill

The Adams Lecture was delivered by Dr. Samuel L. Hoyt, Technical Advisor, Batelle Memorial Institute, Columbus, Ohio, on the subject of the selection of steel for welding.

Samuel L. Hoyt

Dr. Hoyt made a plea for the application of the laboratory findings of scientists on cohesive strength in the manufacture of steel and the design and fabrication of welded structures. He emphasized the greatly increased rigidity of the welded structure, as compared with riveted construction, and pointed out the significance of cohesive strength.

Auto Plant Reconversion, Expansion To Cost Millions

DETROIT—General Motors, barring strikes hopes to be in full production in every division by March 1946.

In commenting on current production, C. E. Wilson, president of General Motors said, "It takes about a year to get production and the government didn't let us start planning soon enough."

C. D. Goad, who heads up the "BPO" (Buick-Pontiac- Olds) Division of GM is planning new assembly plants from coast to coast. These will require miles of new conveyors and many ovens and paint booths to handle the assemblies, also all bodies will be welded together at these plants. Only the stampings will be shipped from Michigan. New York district will have the Linwood, N. J. plant reconverted as a parts and assembly unit. New England will have a plant in Boston, Wilmington, Del. and Atlanta, Ga. will take care of the east coast distribution. Both "BPO" and Chevrolet will have new plants in Los Angeles.

New Chevrolet Plant

H. R. Boyer of Chevrolet says they will add a new 800,000 sq. ft. plant at Flint, Mich., costing ten million dollars and providing 50 cars per hour capacity by July 1946. Altogether Chevrolet is spending $108,000,000 in expansion and reconversion.

S. E. Skinner who heads up the Oldsmobile Division plans 1,300 cars a day by March. The current rate of 100 per day is to be doubled in November and again in December. Pontiac Division was producing 150 cars a day in October and plans for 300 in November and 450 in December. They are shooting for 1,800 a day by March.

K. T. Keller, President, Chrysler Corp. announced the spending of 57 million dollars in getting new equipment, moving it into the plants and clearing them of DPC machinery. Eighteen million dollars worth of plant extensions will be in Detroit alone. Total expenditure at Chrysler will exceed 300 million dollars.

Moving 1835 Tools

The 17 million sq. ft. Plymouth plant had to be completely cleared of war tools and is still in process of being rebuilt for automobile production. The engine machinery and assembly line, however is in production, but the chassis assembly lines are still incomplete. Some 1835 tools had to be moved into this plant, 22 miles of conveyor are being installed now and 646 ft. of drying ovens.

In all Chrysler plants, 70 miles of new conveyors are being installed, 3,100 ft. of spray booths and 8,500 ft. of drying ovens, and 18,090 machine tools have been reconditioned and retooled. Moreover, 974 tools were purchased from the RFC but had to be fixed up and retooled, while 1,256 new machines are now on order from machine tool builders. Chrysler is now trying to put in their new locations and wire up 20,303 machine tools. In addition they have to move 6,390 "DPC" tools off their property. Of these 4,500 are already out of the plant and off company property.

According to A. E. Barit, president, Hudson Motor Car Co., they are running one assembly line now but will have two available when they can be supplied. Production is about 15 per hour now or 120 per day but they have a capacity of 900 cars per day if running full with two shifts. The five-week foremen's strike which just terminated found them with only 200 cars on hand.

Hudson was very fortunate in its reconversion costs. Its assembly lines and body plant machinery were undisturbed during the war. Aircraft material was trucked to the presses in the body plant. As a result, reconversion has cost Hudson about two million dollars and another two millions has been spent for plant improvement. It is planned to spend two or three million more.

$400,000,000 EXPANSION PROGRAM PLANNED

NEW YORK—One of the country's largest makers of capital and consumer goods is launching a program of expansion and modernization that will cost $400,000,000 to $500,000,000. The program includes the construction and equipping of some 20 new manufacturing plants, five of which will be on the West Coast, two in Northern Ohio and one in Illinois. The company intends to replace old production equipment with new, bringing the average age of machine tools in all its factories down from 21 years to 12 years.

GM RECONVERSION WILL COST $634,000,000

DETROIT—General Motors has already made over $200,000,000 in commitments against its $634,000,000 reconversion program. Estimated expenditures are roughly divided as follows: $186,000,000 for land and buildings, $330,000,000 for machinery and equipment, $42,000,000 for tooling, and $76,000,000 for other reconversion costs.

German De-industrialization Starts; Tool Plants Packed Up

WASHINGTON—The destruction or removal of German industrial plants in the United States Army occupation areas was started, as General Dwight D. Eisenhower recommended four-power action by the Allied Control Council of Germany to smash the I. G. Farben industries, gigantic German munitions producer with connections all over the world. Eisenhower proposed: (1) Seizure of Farben plants of assets; (2) Passage of a law confirming such seizure; (3) Investigation of the Farben activities with other German industries; (4) Making these plants or assets available for reparations; (5) Destruction of plants used exclusively for munitions, dissolution of the monopoly by dispersing its remaining assets, terminating its interests in cartels, and controlling its research.

Three Farben plants were immediately scheduled to be blown up, including one smokeless powder plant and two nitrocellulose plants. Such equipment as is not especially designed for munitions purposes will be removed from these plants and transferred to other nations for reparations. The three plants are said to be the first of hundreds of German plants, under American guard, eventually slated for destruction. Even so, General Eisenhower stated that only 9% of Farben plants are located within the American occupation area.

11 Plants Dismantled

At the same time, eleven German plants are to be packed up for shipment out of the American occupation zone to Allied nations decided upon in the form of reparations. Three are machine tool plants: the Fritz Mueller factory at Oberesslinger, the Bohner Doehle Company at Esslinger and the Hans Kolb plant at Stuttgart; one produced airplane engines, the Bayerische Motorwerke No. 1; another, the Alockner Humboldt Diutz at Oberursel, Diesel engines; while a sixth made heavy compressors; one was a shell-loading plant; another an optical plant; and three electric power generating plants.

Machinery Dealers Elect New Officers; Goldman President

CHICAGO—The Machinery Dealers National Association has elected Harvey H. Goldman as President, Max Leach 1st Vice-president, Sam Given 2nd Vice-president, and C. L. McDonald Treasurer.

Names in the News

E. J. Fullam

E. J. Fullam, formerly vice president of The Fellows Gear Shaper Co., Springfield, Vt., was elected president at a recent meeting of the board of directors. He succeeds the late **E. R. Fellows,** founder of the firm. Mr. Fullam has been with the company for over 47 years, serving as treasurer from 1899-1939, when he was elected vice president. Other elections include **E. W. Miller,** general manager, and **R. M. Fellows,** treasurer, as vice presidents.

Francis C. Frary, director of research of Aluminum Co. of America, has been elected to receive the Perkin Medal of the American section of the Society of Chemical Industry in recognition of his outstanding accomplishments in the field of industrial research. Dr. Frary will be presented with the medal at a dinner meeting of the society at the Hotel Commodore, New York, N. Y., on January 11, 1946.

Richard F. Moore

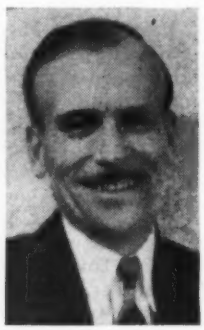
At a recent meeting of the board of directors of the National Tool & Die Manufacturers Association, held in Buffalo, N. Y., on October 4 and 5, the following officers for the coming year were elected: president, **Richard F. Moore,** Moore Special Tool Co., Inc., Bridgeport, Conn.; first vice president, **Willis G. Ehrhardt,** Ehrhardt Tool & Machine Co., St. Louis, Mo.; second vice president, **Leonard E. Mingus,** Wm. P. Stein & Co., Inc., Rochester, N. Y.; secretary, **Jack Kleinoder,** John Volkert Tool & Die Co., Brooklyn, N. Y.; and treasurer, **Herbert F. Jahn,** The B. Jahn Manufacturing Co., New Britain, Conn.

J. J. Smith has been named to succeed **W. L. Lentz** as manager of the Schenectady plant of American Locomotive Co. Mr. Smith has been assistant superintendent since joining the company in 1944.

R. H. L. Becker has joined the Ohmer Corp. as vice president while **F. J. Nichols** has been named assistant to the president of the same firm.

Lewis J. Male, assistant general superintendent of General Electric Company's Schenectady works, has been appointed general superintendent to succeed **Bernhard G. Tang,** whose recent retirement concluded over 45 years of service with the company. Mr. Male has worked in various of the company's divisions since joining the firm in 1913.

Lewis J. Male



Earl V. Johnson

Earl V. Johnson has been appointed director of sales of The Dayton Carbide Tool Co., Dayton, Ohio. Mr. Johnson for the past 10 years has been employed as carbide tool engineer for Ohio by the Firth-Sterling Steel Co.

Carl P. Sorenson, formerly with the Glenn L. Martin Co., Baltimore, Md., has been appointed consulting standards engineer for the Cherry Rivet Co., Los Angeles, Calif.

William E. Klingeman has joined the Precision Welder and Machine Co., Cincinnati, Ohio, as chief engineer. He has been with Federal Machine and Welder Co., Warren, Ohio.

The Ford Motor Co., Dearborn, Mich., has recently made several additions to its staff. Included in this group are **Clyde R. Paton,** until recently director of automotive engineering at the Packard Motor Car Co., who has been named a consulting engineer and **Robert F. Kohr,** a development and research engineer who, since 1942, has been chief liaison engineer for the aircraft development section of General Motors Corp., has joined the staff of the automotive research engineering department.

G. G. Landis

H. F. Kneen

H. F. Kneen has been named vice president in charge of manufacturing and **G. G. Landis,** vice president in charge of engineering for The Lincoln Electric Co., Cleveland, Ohio. Mr. Kneen, general plant superintendent for several years, joined Lincoln Electric in 1929, while Mr. Landis, chief engineer since 1930, has been with the firm over 20 years.

Frank J. Donovan, secretary-treasurer of The Kaydon Engineering Corp. since its inception, was recently named president and general manager of the firm to succeed **A. Harold Frauenthal** who has been elevated to the new position of chairman of the board of directors.

Charles H. Peirce has been appointed sales manager of the Edward Blake Co., export manufacturers for machine tools, Newton Center, Mass. Mr. Peirce was previously with the Taylor Instrument Co. for nine years in their industrial application field.

John D. Small

J. D. Small, Chief of Staff of WPB, has been named administrator of the newly formed Civilian Production Administration which succeeded WPB on November 3. Mr. Small headed the committee in charge of WPB's program for the transitional period between the end of the war in Europe and the defeat of Japan and which also drew up the WPB plan for full reconversion of industry that went into effect on V-J Day.

John S. Tawresey

Frank C. Tippery

John S. Tawresey has been appointed vice president in charge of engineering of The Bunting Brass & Bronze Co., Toledo, Ohio, where he will direct research and study of modern bearing design and applications. Mr. Tawresey, formerly a lieutenant colonel at Wright Field, Dayton, Ohio, served as executive assistant to the chief of the Resources Control Section of the U. S. Army Air Corps.

Frank C. Tippery has been appointed works manager of the Ithaca, N. Y. plant of the Morse Chain Co. Mr. Tippery was formerly with the Ford Motor Co. where he served in many capacities.

BUSINESS ITEMS

Ford Motor Co. has purchased 78 acres of land near Metuchen, N. J., for the construction of a new plant to assemble Mercury and Lincoln automobiles. Construction of the new plant will start early next spring and will be capable of producing 350 cars a day. This will be the first plant to build Lincolns outside the Detroit area.

Western Electric Co. has purchased property and will construct, as soon as materials are available, a new electronic components plant at Allentown, Pa. Plans call for an office building and one for manufacturing which are expected to be in operation about one year after construction begins.

Marshall-Eclipse Div., Bendix Aviation Corp. is breaking ground for a new factory in Troy, N. Y. The new plant, now under construction, will be four times larger than all of the present buildings of the division and will cost more than $500,000.

Dover Industries, Inc., 2929 North Campbell Ave., Chicago, Ill., has started operation. This new enterprise, organized to do manufacturing and jobbing of metal articles requiring plated finishes, is headed by **L. D. Jensen** as president with **O. A. Wettlaufer** and **E. L. Berkenkotter** as vice presidents.

The **Rolled Thread Die Co.,** Worcester, Mass., has appointed **C. L. Robertson Co.,** 709 East 38 St., Indianapolis, Ind., as exclusive sales representatives for southern and central Indiana of Reed cylindrical-die thread rollers and RTD thread rolling dies.

Food Machinery Corp. recently acquired the assets and business of the **Mechanical Foundries, Inc.,** at Vernon, Calif. The new subsidiary, known as **Mechanical Foundries Co.,** will be headed by **Fred C. Edmison** as president and general manager.

Hewitt Rubber Corp. has purchased a large plant adjacent to the company's headquarters on Kensington Ave., Buffalo, N. Y., to provide additional manufacturing space. Purchased for $200,000, $150,000 will be spent in reconditioning the plant and an additional $350,000 worth of new production machinery will be installed.

Cambridge Machine Tool & Aircraft Supplies, Ltd., Montreal, Canada, has recently changed the company name to **Cambridge Machine Tools, Ltd.** The firm will move soon to larger premises at Verdun Industrial Bldg., 425 River St., Verdun, P.Q.

F. L. Jacobs Co., Detroit, Mich., has acquired the Indianapolis plant of the **International Detrola Corp.** As a result of the sale of their Indianapolis machine tool plant and equipment, International Detrola has transferred the production and servicing of its Libby turret lathes to their Elkhart, Ind., plant.

The **Washington Steel Corp.,** Washington, Pa., has been formed to produce stainless steel in both sheet and strip form. The corporation has purchased the plant and facilities formerly owned by the **Washington Tin Plate Co.** and will install new machinery to handle stainless steel. **T. S. Fitch,** former manager of the Composite Steel Div., Jessop Steel Co., is president, and **F. G. Gerard,** formerly plant superintendent, Eastern Rolling Mill Co., is vice president in charge of operations.

The capital stock of the **Williams Tool & Engineering Corp.,** Indianapolis, Ind., has been purchased by **Raymond G. Hathorn,** Cleveland industrialist. $100,000 in machine tools and new equipment will be added to present facilities as soon as possible. In the reorganization which followed the purchase, Hathorn was elected president, **Vernon Burt,** secretary; **Arthur Black,** treasurer, with **Fred Williams, Jr.,** remaining as general manager.

The **Columbia Axle Co.,** Cleveland, Ohio, manufacturers of automotive and airplane parts, has been purchased for approximtely $725,000 by 120 employees of the concern and 30 associates of the former owners, the Schott interests of Cincinnati.

Precision Welding & Machine Co. of Cincinnati, Ohio, moved their plant from quarters at English and Neave Streets to the newly purchased building at 138 East McMicken Ave. on November 1.

OBITUARIES

Robert W. Gray, 69, one of the founders and the first president of the Gray and Prior Machine Co., Hartford, Conn., died Oct. 23. Mr. Gray was elected president and treasurer of the firm when it was formed in 1900 and remained active in the business until this year when he was elected chairman of the board of directors.

Stoddard B. Martin, 53, Cleveland manufacturer, inventor and machine tool representative and owner of the S. B. Martin Co., was drowned Oct. 5, while on a fishing trip at Parry Sound, Canada.

Eldon L. Cunningham, president of the Central Brass & Aluminum Foundry Co., Cincinnati, Ohio, passed away Oct. 6. Mr. Cunningham had been president of the foundry for 23 years and, prior to that, had been connected with the Triumph Electric Co., Oakley, Ohio.

MEETINGS

American Machine Tool Distributors Association. Annual meeting. Hotel Statler, Cleveland, Ohio. Nov. 19-20. Thomas A. Fernley, Jr., executive secretary, 505 Arch St., Philadelphia, Pa.

American Society of Mechanical Engineers. Annual meeting. Hotel Pennsylvania, New York, N. Y. Nov. 26-30. Ernest Hartford, assistant secretary, 29 W. 39 St., New York, N. Y.

National Metal Trades Association. Annual convention. Hotel Cleveland, Cleveland, Ohio. Nov. 16-17. Charles L. Blatchford, secretary, 122 S. Michigan Ave., Chicago, Ill.

Society of Automotive Engineers. National Air Transport Engineering meeting. Edgewater Beach Hotel, Chicago, Ill. Dec. 3-5. John A. C. Warner, general manager, 29 W. 39 St., New York, N. Y.

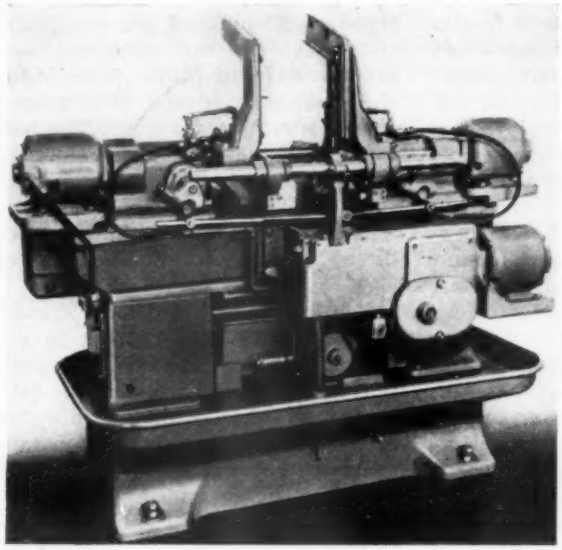
Shop Equipment News

Pratt & Whitney Centering Machine Centers Two Ends in One Operation

Pratt & Whitney Division, Niles-Bement-Pond Co., West Hartford, Conn. has announced a 1¼ x 18 automatic centering machine capable of producing center holes simultaneously in each end of a piece of stock. Except for initial setup, the machine can be handled by unskilled labor, as it requires only keeping the magazine supplied with work, taking away centered parts, and caring for the ordinary center drills used.

Both ends of the work are centered in one operation, with the drills being fed in conjunction with a full-automatic work-handling mechanism. The drills are withdrawn twice during the operation, to clear out chips and permit oil to enter the drilled holes. The cam path controlling this feed is arranged in three steps so that after each withdrawal, the center drills go in to a greater depth—reaching full depth at the last advance. The two drill spindles are mounted in preloaded ball bearings inside quills, which, in turn, are actuated by a rack and pinion feed through spring resilient levers. Both drillheads can be adjusted on the bed to any desired position and then positively clamped. Each is driven by a ½-hp. foot-mounted motor which permits easy motor replacement. Oil supplied continuously to the drills from a gear pump, and surplus oil drains to a tank underneath.

The magazine holds the work and allows it to feed down by gravity to the transfer slides. The magazine ways have adjustable guides to accommodate work ranging from ⅜ to 1⅜ in. dia. The magazine may be set to accommodate a range of work varying from a minimum length of 3½ in. to a maximum length of 18 in. The transfer slides carry the work forward from the magazine, one piece at a time, to the centering drills and hold it in correct position for accurate centering. The transfer plates on the slides remain in contact during the centering operation. These transfer plates hold the work in the V blocks and are actuated through adjustable toggle levers from a cam—thus obtaining rigid clamping. The transfer slide can be adjusted for any necessary length of stoke. A compensating arrangement on the V jaws automatically takes care of small variations in work diameter. These jaws also may be adjusted to drill holes out of center on one or both ends, such as short oil holes, or holes for the driving pins used in grinding. The work-transfer slides, magazine uprights and the work holding V blocks all are mounted on bases which can be adjusted to any desired position

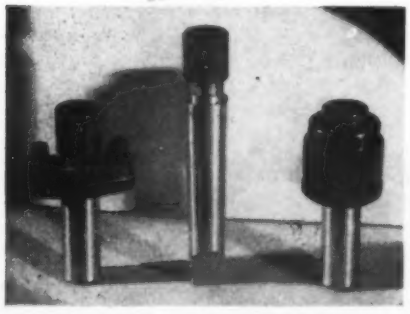


Fully automatic operation of the Pratt & Whitney centering machine permits all setup controls and adjusting cam mechanisms to be placed in positions best suited to precision and simplicity. Release mechanisms, cam indexing arrangements and depth stops are located at the rear of the machine

on the bed and clamped in position. The entire automatic mechanism on the rear of the bed is driven by a ½-hp. foot-mounted motor. A crank is provided for moving the entire mechanism by hand during set-up. The machine is equipped with push-button control convenient to the operator's right hand.

The length of stroke of the drill spindle can be varied from ⅜ to 1¼ in. and the maximum countersink diameter is 5/8 in. Stops are provided to limit the forward movements of the drill spindles. These stops meet either of two conditions: they can be set to bear against the end of the work, and so hold the centering depth to a predetermined dimension; or they can be reversed so that they engage lugs on the drill head casting. This limits the forward movement of the spindles and brings the center holes the same distance apart, regardless of variations in the length of work.

The machine is supplied with change gears which provide four different camshaft speeds of 2.9, 4.3, 6.1 and 9 cycles per minute. Two sets of collets, 3/16 and 7/16 in., are provided—while other sizes are available on special order. The machine occupies a floor space 72 × 34 in. and is 54 in. high.



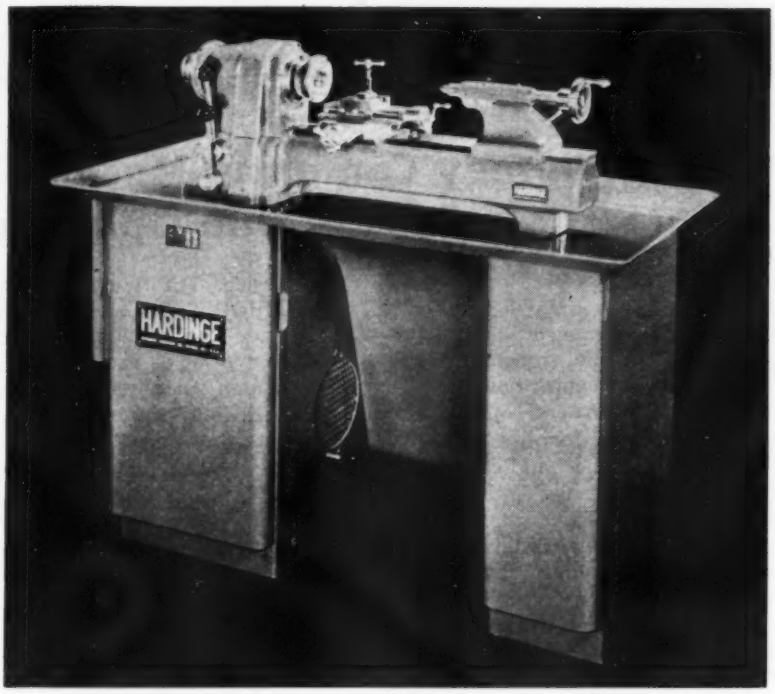
Kett toolholders are provided in styles to suit specific applications

Kett Toolholders Eliminate Bushings in Machine Set-Ups

A floating toolholder is included in the line introduced by the Kett Tool Co., 5 E. Third St., Cincinnati 2, Ohio. The Kett chucking tools embody a three-jaw chucking mechanism as an integral part.

The chuck will hold shank sizes from No. 80 to ¼ in. without changes and eliminates the necessity for many sizes of bushings and collets for machine set-up requirements. The chucking mechanism is constructed to maintain the tool against torque shocks and side pressures.

Hardinge Precision Speed Lathe Designed to Eliminate Vibration



DV59 lathes have operating equipment and accessories inclosed in the cabinet which serves also as the base of the machine

Hardinge Brothers, Inc., Elmira, N. Y., announce their model DV 59 Hardinge high-speed precision lathe for use in toolrooms, laboratories and production departments.

The steel bed ways are of improved dovetail design. These ways are hardened and ground to master gages to assure accuracy and interchangeability of attachments. Dovetail bed ways form a solid bed top. The design of the dovetail ways protects the angular way surfaces from falling chips and foreign matter.

The lathe bed has a three-point mounting on the welded-steel pedestal base. The three-point mounting insures original bed accuracy even when the machine is placed on an uneven floor.

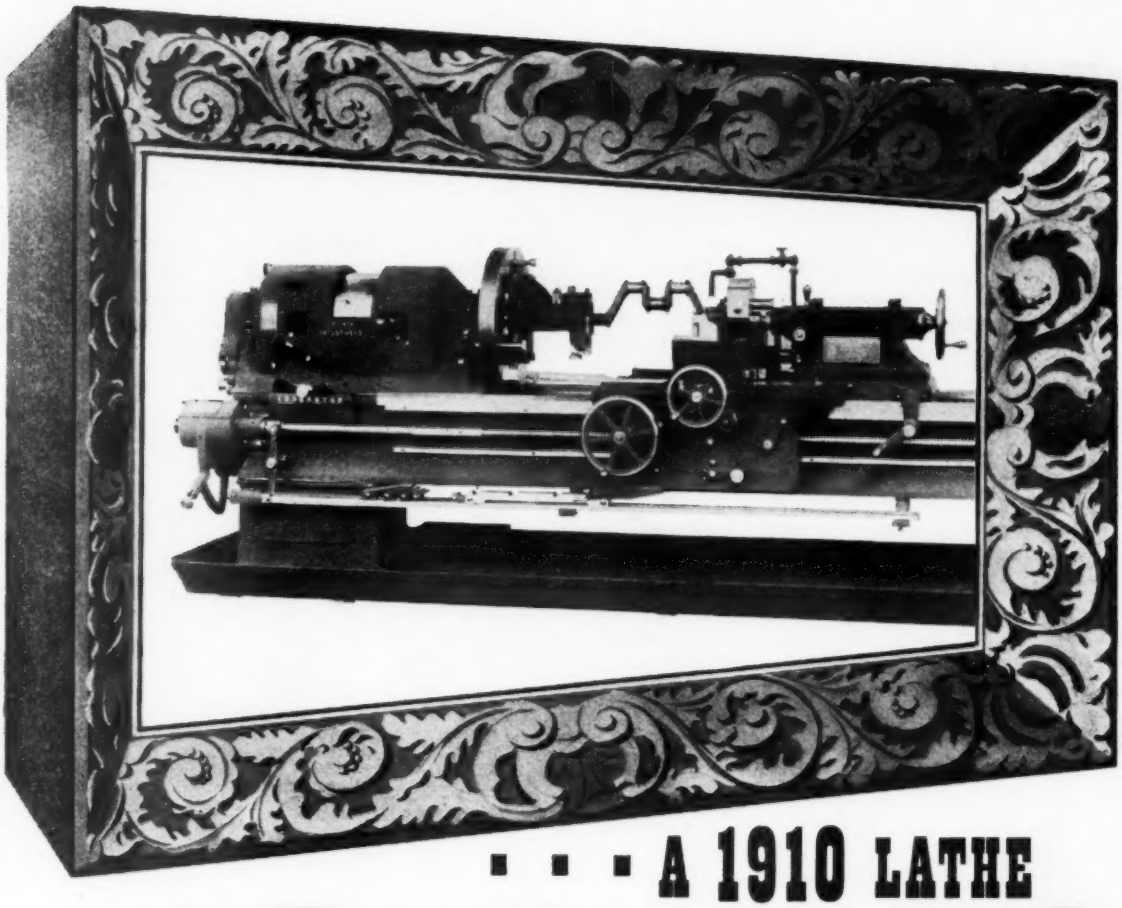
The fully enclosed headstock has preloaded ball-bearing-spindle construction. The spindle is ground to take standard 1-in. capacity 5C Hardinge collets and 6-in. capacity step chucks. The spindle nose is supplied with either the Hardinge standard taper nose or standard threaded nose for the direct application of step-chuck closers, jaw chucks and faceplates. The headstock spindle is driven by a center drive belt. The center-drive construction places the belt between the spindle bearings for balanced bearing spread and equal distribution of belt pull. The belt is easily replaceable without removing any part of the machine.

The compound slide rest is securely anchored to the dovetail bed ways by a positive lock. This lock affords rapid positioning of the compound slide rest on the hardened and ground dovetail ways. The index slide has a hardened and ground steel section to resist wear. The feed screws are hardened and mounted in preloaded ball bearings Index slide will swivel 360°. The large feed-screw dials are graduated for direct reading in increments of 0.001 in.

The ball-thrust tailstock spindle has a constant full bearing in the tailstock body regardless of the position in the tailstock body. The tailstock body has a mating dovetail section to securely anchor the tailstock to the dovetail ways.

Welded-steel pedestal base fully encloses the driving unit and tool storage compartment.

Electrical equipment provides magnetic control with start and stop push-button operating on 110 volts and has time-lag thermal overload relays providing overload and low voltage protection.



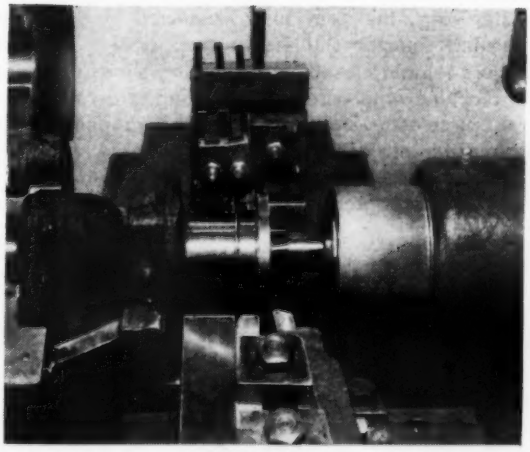
. . . A 1910 LATHE

for Today's Crankshaft Jobs?

● The "old timer" pictured above was mighty good for its day. On a crankshaft job one tool in a simple toolholder was then adequate. But feeds and speeds were unbelievably slow . . . rapid duplication of parts impossible. And skilled operators were essential.

Consider, in contrast, today's latest 2A or 3A Duomatic—Lodge and Shipley full automatic lathes. View at the right also shows a crankshaft job—with six tools cutting simultaneously. Dual tool slides—front and rear—operate singly or together, permit any combination of "in" or "out" facing cycles, turning, boring or forming, *without special attachments!* Unskilled operators produce large or small lots with equal facility.

If you have "antiques" or war-weary lathes call in L & S Engineers. A modern L & S Lathe can replace several of these out-worn tools—give you production, accuracy, and low costs never before possible.



Write on your company letterhead for detailed literature on the following: Engine, Tool Room, Automatic, Manufacturing, Oil Country Lathes.

THE LODGE & SHIPLEY MACHINE TOOL CO.

L & S LATHES

CINCINNATI 25, OHIO, U. S. A.

MACHINE TOOL DIVISION 3055 COLERAIN AVE. • SPECIAL PRODUCTS DIVISION 800 EVANS ST.

Sheffield Automatic Piston-Ring Inspector Classifies All Rejects

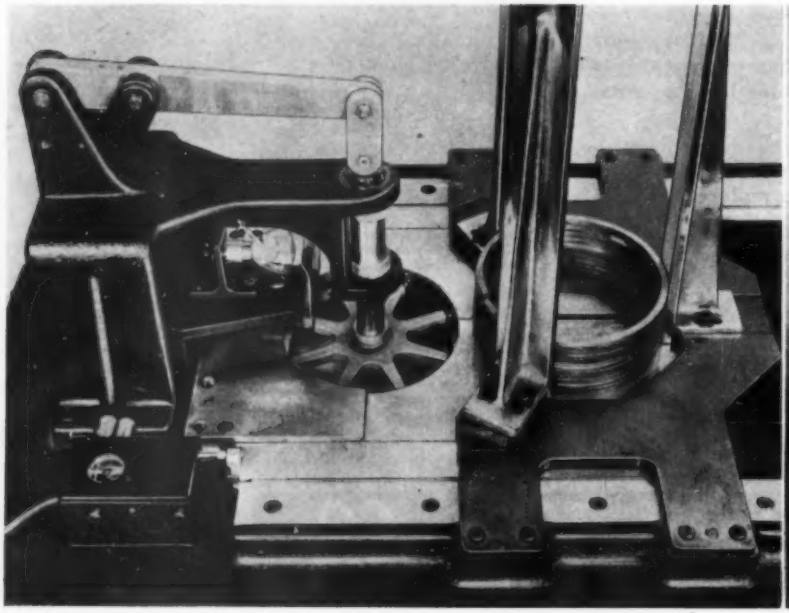
A gaging machine has been developed, for full automatic checking of piston rings, by the Sheffield Corp., Dayton 1, Ohio. With the Sheffield automatic piston-ring inspector, 100% inspection of the gap and periphery is more accurate and less expensive than sample checking by hand. Salvageable rings are classified so rework costs are lowered. This single-purpose machine will check an average of 1500 rings per hour and can be adapted to other sizes and types of rings by changing various elements of the tooling.

The machine segregates rings into three groups: (1) acceptable periphery and gap, (2) reject gap and (3) reject periphery because of failure to meet requirements. The entire checking and separating operation is done automatically, the operator only having to load rings into the feeding device. Electronic circuits, photo-electric cells, microswitches, solenoids, and relays are incorporated in the automatic cycle to actuate gaging and selector devices.

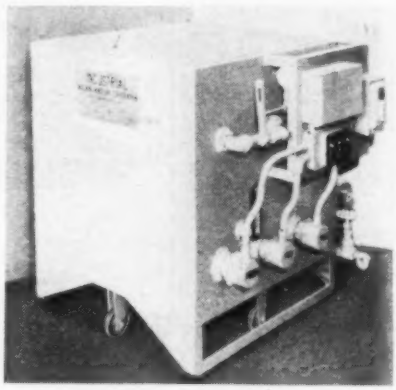
The automatic cycle starts when the feed slide moves to the rear, selecting the bottom ring from the stack and carrying it into gaging position formed by the 180° arcs in both the feed slide and stationary compression plate. As the slide and compression plate come together, the piston ring is compressed so the gap is closed and the width of gap is determined. A deviation of 0.001 in. from the master can be detected.

The vertical-feed spider then descends onto the piston ring, pushing it into a constantly rotating master ring. Rollers on the ends of the spider fingers assist in properly positioning the piston ring opened to its normal operating position. A concentrated beam of light projected through an optical system scans the outside periphery of the ring where it is in contact with the master ring while it makes slightly more than a complete revolution. If the ring is not sufficiently light-tight at any point on the periphery, light penetrating through the clearance between the piston ring and master ring energizes a photo-electric cell which sets up a holding circuit by means of a relay. This relay is not energized if the piston ring is acceptably light-tight and the check is accurate to within 0.0001 in.—a clearance of 0.0002 in. will be accepted, while that of 0.0003 in. will cause the ring to be rejected. The device can be set for whatever tolerance is desired.

The inspected ring revolves with the master ring while the feed slide returns to original position, picks up another ring and carries it through the gap-checking operation. Then, as this second ring is injected into the revolving master ring, the previously inspected ring is ejected onto two solenoid-operated selector shutters or trap doors. If the ring is acceptable, both shutters remain closed, and the ring slides on through and out the front of the machine onto a rack. If the ring is a reject because of either periphery or gap, selector shutters permit the ring to fall by gravity into the reject stations on the sides of the machine. A spring-loaded clutch throws the driving mechanism out of gear should the machine jam because piston rings lace together during loading into the feeding mechanism



The automatic piston ring inspector will inspect and classify 1,500 rings per hour



Unit can be used for cleaning stampings, bearings, castings, and other small parts

Industrial Washing Machine Transports to Work Positions

A portable washing machine, manufactured by the Industrial Washing Machine Corp., New Brunswick, N. J., is known as model C.B.H. The

WITH Cadillac's new Pla-Chek you can get out five times as much surface plate inspection work as you do now—and it will be accurate because Pla-Chek is guaranteed accurate to .00005″.

Pla-Chek is a hardened steel bar with 12 steps spaced exactly 1″ apart; a micrometer screw thread ground on the lower end; a large micrometer thimble graduated in .0001″ on the upper end of the bar and a simple triangular-shaped support bracket.

With this bracket set on a conventional surface plate and the micrometer thimble set at zero, the lower end of the bar is exactly level with the surface plate.

The micrometer is then set for the desired dimension in thousandths and tenths of thousandths and the measurement is taken from the desired inch step. Measurements are guaranteed accurate to .00005″ for any size from .001″ to 12″ from the surface of the plate.

TWO WEEKS FREE TRIAL

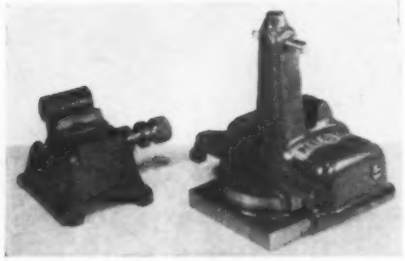
So that your inspectors can see how much time Pla-Chek will save them, we will send it on two weeks free trial. If this trial satisfies you, send your check, if not, return Pla-Chek express collect and you owe us nothing.

Cadillac GAGE COMPANY

20316 HOOVER ROAD • DETROIT 5, MICHIGAN

unit consists of a tank and housing equipped with wheels. Mounted on the housing are electric immersion heaters, a pump and motor, valves, switches and gages.

Parts to be cleaned are placed in a square-mesh basket 16 x 16 in.; cover is lowered, and the spray valve turned. The force of the spray causes the basket to rotate so all material is cleaned. If desired, the basket can be removed and the machine can then be converted temporarily into a dip tank for direct wax or oil dipping of parts in process.



Madco universal wheel dresser simplifies forming of wheel contours to templets

Madco Universal Wheel Dresser Forms Contours to Templet

Madco Products, Inc., 516 Fifth Avenue, New York 18, N. Y., announces a universal grinding-wheel dresser designed for reproducing templet forms as well as cutting angles and radii. The dresser, designated as No. 41, will reproduce any number of times, template forms up to 1½ in. length, cut angles at any degree, and produce both convex and concave radii up to 1 in.

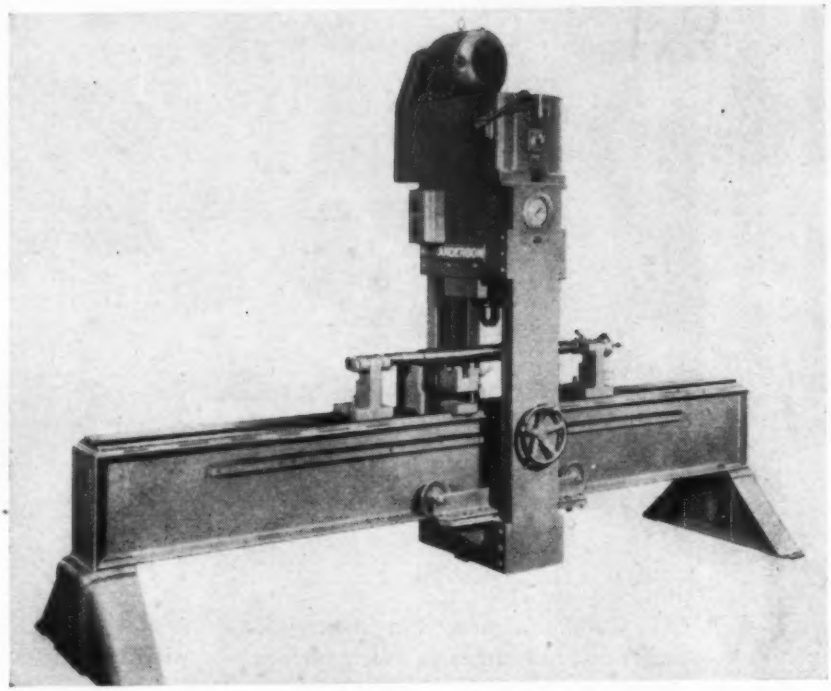
The No. 41 is heavily constructed to permit heavy as well as fine cuts to be made without chatter or vibration. Its design provides for setting with size blocks for radius dressing and with a sine bar for angle dressing when a higher degree of accuracy than can be obtained with the regular calibrated base dial is required.

To cut a wheel at any angle, it is necessary to set the calibrated dial at the required angle, place the dresser on a magnetic chuck, backing side required against backing-guide strip on chuck, and push the body of the dresser in either direction by hand. For extremely close angles, the dresser can be set with a sine bar by substituting a diamond tool with an indicator.

For radius cutting, the diamond tool is first positioned with a gage to bring the cutting point in correct relation with the axis of rotation of the dresser. Dresser is then set to cut either a concave or convex radius by placing size blocks or a calipers between either of two gage points on the base.

Templet or form dressing is accomplished by mounting the dresser head on a special base provided. It is removed from the base used for radius and angle dressing by loosening two set screws and lifting off. When positioned on the templet base, the dresser has a floating action which is guided by an inserted templet. A form corresponding to the templet is cut in a grinding wheel by turning a knob to move the dresser head back and forth. Templets can be any thickness from 1/32 to 3/16 in. and will reproduce forms up to 1½ in. long.

Anderson Straightening Press Permits Operation by One Man



The Anderson straightening press for application of high bending pressures utilizes a movable ram to eliminate shifting of heavy parts

To facilitate the loading of heavy work in straightening presses, Anderson Bros. Mfg. Co., Rockford, Ill., has developed a power hydraulic press. With the traveling ram at one end of the press, the crane can lower heavy work into place on the machine and then the traveling ram can be placed over the work wherever required.

The ram rolls on four ball-bearing equipped wheels and the balanced-ram assembly rolls with ease. The table is equipped with a V-slide on which are mounted spring-loaded centers and checking rolls.

The Anderson indicator tells the operator four things:

(1) the amount of runout, (2) where to stop the shaft and do straightening. (3) during the pressure operation, it tells the operator how much he is bending the shaft; (4) and last, as soon as the pressure is released it tells him what happened on the first straightening try and gives a guide for the next operation.

The bed is a welded structure 11 ft. long, however, the length can be made to suit requirements.

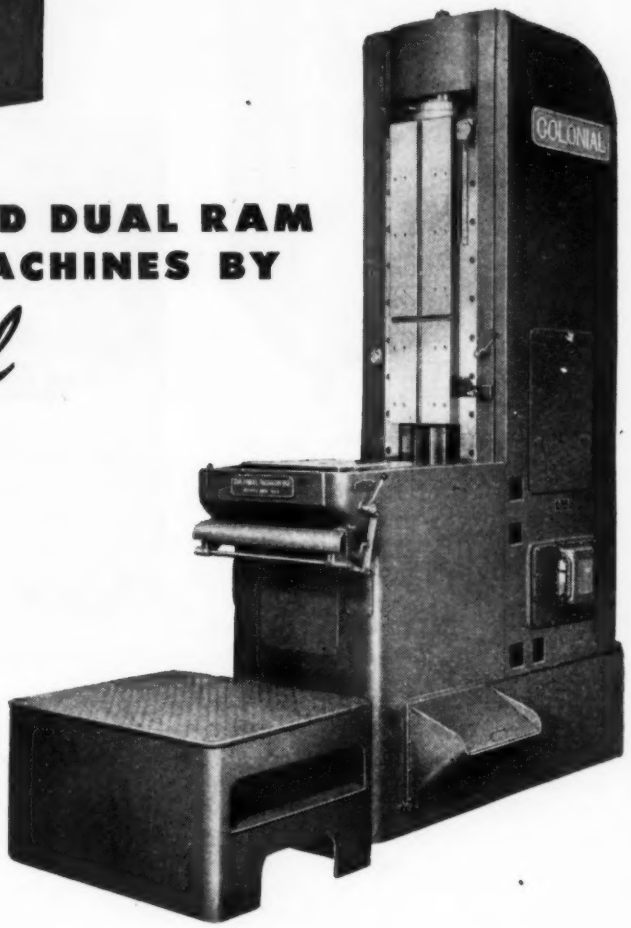
The capacity of this press is 50 tons, is the maximum available.

The hydraulic unit is manufactured by the John S. Barnes Corp. and was designed especially for this straightening press. The length of the stroke of this ram is 6 in. Longer strokes are available. Power requirements are a 3-hp. motor.

Designed to Cut TODAY'S Machining Costs

At Left: Dual ram machine without tooling.

Below: Typical single ram type.



THE IMPROVED SINGLE AND DUAL RAM SURFACE BROACHING MACHINES BY

Colonial

Even before the war, Colonial Hydraulic Single and Dual ram surface broaching machines had become the leaders in their field—mass production machining of outside surfaces at the lowest cost per piece.

Excess capacity for heavy duty jobs, maximum freedom from service trouble in continuous operation, rigidity to prevent deflection and maintain accuracy, provision for shuttling or other forms of automatic retracting loading tables, speed adjustable to meet the specific need for any given job, dual safety controls plus emergency knee-bar stop. These are just a few of the features built into every Colonial Single and Dual Ram Machine, whether they be of light tonnage with *minimum* stroke or heavy duty with *maximum* 66" stroke.

colonial BROACH COMPANY
DETROIT 13, U.S.A

Broaches — Broaching Machines - Broaching Equipment

Dot-Weld Process Controls Arc And Prevents Excessive Heating

The Metallizing Company of America, 1330 W. Congress St., Chicago 7, Ill., announces the development of the Mogul Dot-Weld process, which eliminates residual stress and contraction resulting from high-temperature welding.

The Dot-Weld Process is an improved technique of spot-welding

The Dot-Weld process, by air-quenching the arc while welding progresses, minimizes thermal distortions of large masses and permits welding thin sections without burn-through

and is the closest practical approach to a true cold weld. It utilizes the Mogul Quench-Arc weld machine, a high-amperage, low-voltage unit operating on alternating current, and the Dot-Weld pistol. This combination affords depths of penetration from 0.001 in. up to 1/32 in., yet all danger of high temperature is eliminated by a specially designed air-pressure unit built into the pistol which quenches the electrode. This feature prevents the development of high heat volumes in the base metal and consequent heat distortion and residual stresses.

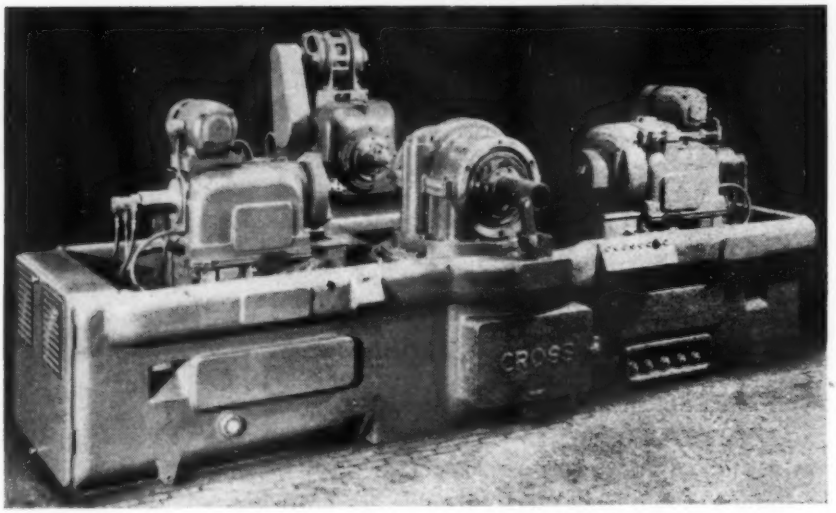
The process makes possible the low-cost salvage of ferrous and most non-ferrous castings rejected because of blowholes and other defects, by providing machinable fill-in deposits of aluminum, bronze, nickel, or zinc which can be applied to any metal. Where castings repaired by Dot-Welding will be subject to operating pressures, it is recommended that sealants be used for sealing any porosity.

Dot-Welding can be used for parts repair where tapping is necessary and surfaces can be projected without backing over thin areas that have broken through in machining. Where a shrinkage fissure has appeared in a casting the defective area can be cut out and replaced with a solid build-up. The quench-arc principle permits broader sequence of spot-welding and multiple passes without irregular bluewalls caused by dwells.

In addition to its application in the repair of defective castings, Dot-Welding is suitable for press-fit work, repair of cracked engine blocks and heads of internal combustion motors, and build-up of aluminum, bronze, steel and grey-iron patterns.

The Dot-Weld process includes the Dot-Weld pistol and the 220-volt, 60-cycle, single-phase Quench-Arc welding machine. The Quench-Arc machine is furnished complete with cabinet, enclosed hinged-top storage compartment, two 15-ft. lengths of cable, male and female receptacle, heavy-duty ground clamp, 20 ft. of air hose with fittings, wall receptacle and full instructions. Models are also available in other voltages and cycles to suit requirements.

Cross Processor for Oil-Tool Joints Bores, Faces, and Mills Threads



Cross automatic processor combines three precision operations in the production of tool joints for oil-drilling rigs

Taper-thread milling (6-pitch Acme thread), precision-boring and precision-facing operations are automatically performed on heat-treated alloy-steel oil-tool joints with a special machine manufactured by the Cross Co., Detroit, Mich.

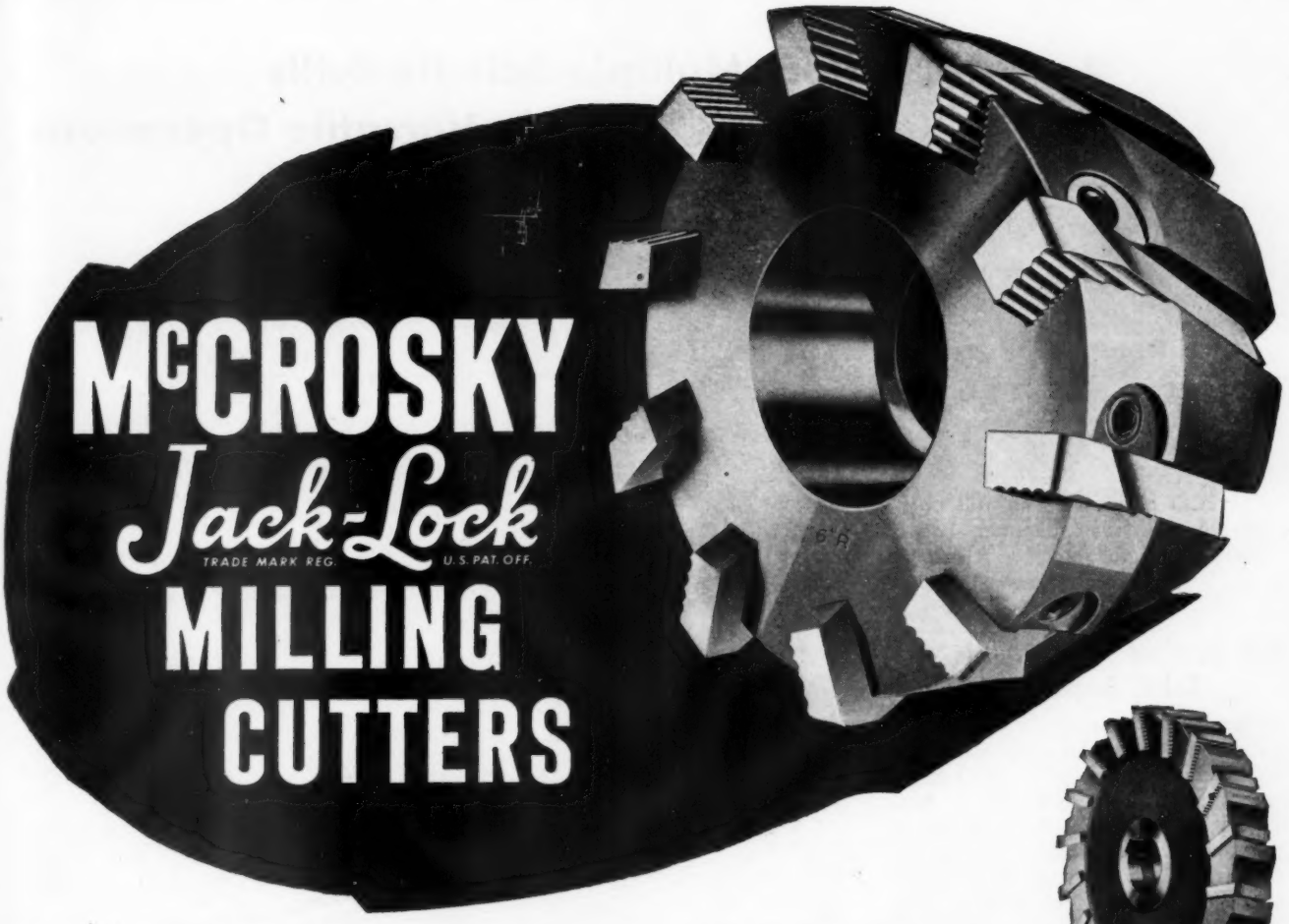
The machine chucks two joints at opposite ends of a central work-holding fixture with provision for rotating the work in milling the threads. The boring and facing operations are performed simultaneously at the other two stations. Pieces are unloaded and loaded during the threading cycle.

Features include: Power automatic indexing, location and clamping of the work held stationary at stations 1 and 3, automatic work rotation at station 2, rough- and finish-taper thread-milling operation with electrically controlled operating cycle arranged for automatic resetting of the cutter for the second and finishing cuts.

A dial indicator is mounted on a pivoted bracket forward of the front loading station. This is used to mount the joint with a minimum of eccentricity between the revolving turret and the part overhang.

McCROSKY Jack-Lock MILLING CUTTERS

TRADE MARK REG. U.S. PAT. OFF.



FACE, SHELL-END, HALF-SIDE, STAGGERED TOOTH AND "SPECIALS" TO MEET ANY REQUIREMENT

● Conceived, perfected and available only from McCrosky,—Jack-Lock Milling Cutters give users a maximum of long, efficient, satisfactory service. Blades on Jack-Lock Cutters are held rigidly and solidly,—but can be released easily, and without hammering. Fine pitch back-up screws assure accurate and uniform adjustment so that a minimum of blade stock is lost in regrinding, a particular advantage when carbide tips are used. A fewer number of Jack-Lock Cutters will keep a job in continuous production, reducing tool inventories.

Specify McCrosky service-proved Jack-Lock Cutters, and get—in your plant—all the design, construction and operating advantages only McCrosky Jack-Lock Cutters can give you.

McCROSKY TOOL CORPORATION
MEADVILLE, PA.

COST CUTTING TOOLS

Designers and Manufacturers of

Jack-Lock MILLING CUTTERS

Block Type BORING BARS

Wizard CHUCKS AND COLLETS

Super Adjustable REAMERS

Turret TOOL POSTS

The ECO gearless pump will pass abrasives without damage. Faceplate is removable for clearing large obstructions

ECO Gearless Pump Propels Solids Suspended in Fluids

A gearless pump for water, light, oil or other liquid circulating use has been introduced by ECO Engineering Co., 12 New York Ave., Newark 1, N. J. The pump is equipped with special bearings which require only water lubrication, eliminating the need for grease cups. No adjustments are needed. All metal is bronze, so the pump can be used in oil or fresh or salt water. Pump can be easily installed and can be mounted at any angle for operation in either direction.

The impeller, a removable unit, is of tough resilient material composed of several layers of laminated sections, vulcanized together under great pressure. It enables sandy, muddy, or gritty particles to pass without harm to the pump.

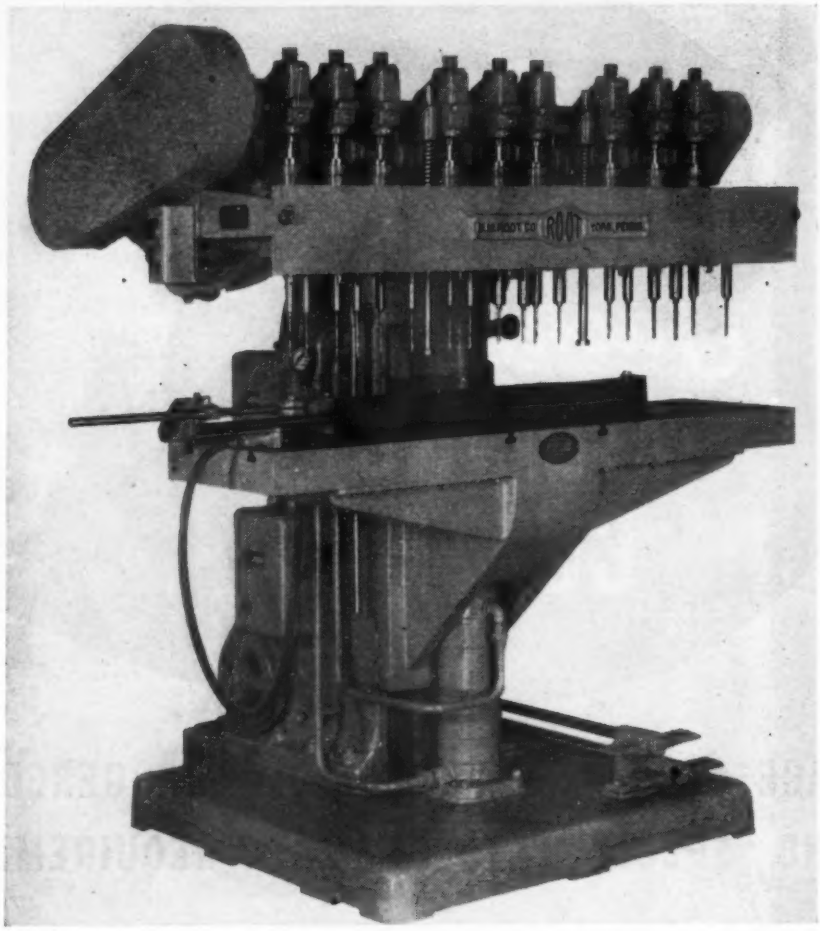
Available with single impeller and standard ½-in. connection and double impeller with standard 1-in. connection.

Range of Wales Dies Doubled By Added Heavy-Duty Units

Wales, heavy-duty, type BJ, hole-punching units, designed to pierce metal up to ¼-in. thick, have been announced by Wales-Strippit Corp., 345 Payne Ave., North Tonawanda, N. Y. These units are the first in the Wales line that have rated capacity for punching holes in metal more than ⅛ in. thick.

Each unit consists of a holder that carries the punch, die and stripping mechanism. Type BJ units are available in three holder widths with maximum diameter of ¾-in.

Root Multiple-Spindle Drills Provide Versatile Operations



Variable table feed and spindle speed arrangement of the root CDH multiple-spindle drill minimizes delays in changeover operations

The CDH manufactured by B. M. Root Co., York, Pa., is a multiple-spindle drilling machine with a hydraulic-feed table system for production drilling of plastics and metals. A range of spindle equipment is available for the drilling of various patterns of regularly or irregularly spaced holes of different sizes on close or extended centers. The spindle equipment includes single spindles, cluster drillheads for close-center work, and single and double expansion spindles. These spindles can be equipped to receive either straight or tapershank drills or self-centering adjustable chucks.

A metal table is furnished with milled T slots for attaching jigs or fixtures. The system of hydraulic table feed has a stepless feed selection of from 2 to 35 table strokes per min.

Stepless variation of the feed rate makes it possible to use the correct feed for the work being handled. In this way the machine can be timed to suit the normal working speed of the operator so he can concentrate on loading and unloading tables. Provision is made for automatic continuous or intermittent feed as desired. A working and safety feature is that the table can be started, stopped or reversed at any point of the feed or return stroke by means of treadles. The length of the table stroke is adjustable from ½ to 16 in. Provision is made for installing a coolant system.

A rapid-traverse table feed uses a fast feed and return motion of the drilling table with a slow predetermined cutting feed coming into action as the drills enter the stock.

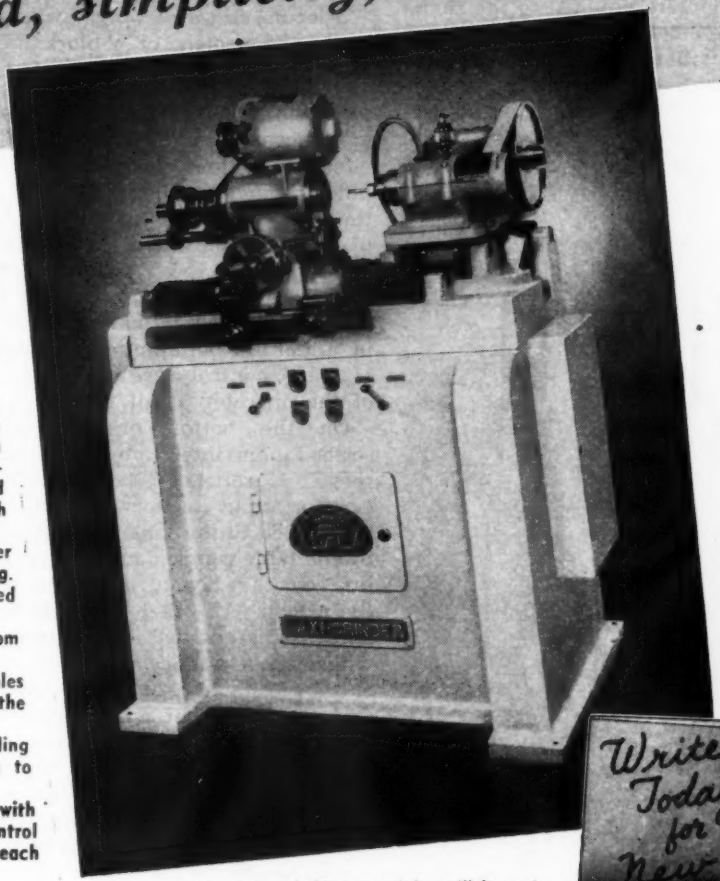
The machine can be furnished with a variable-speed spindle drive in 3, 4, 5, and 6 ft. length capacities.

NEW! DIFFERENT!

A GREAT STEP FORWARD IN INTERNAL GRINDER DESIGN!

AMAZINGLY ACCURATE!

New Maxi-GRINDER features Unusual Design . . . Developments offer combined speed, simplicity, wide range



These features make the Maxi-Grinder outstanding as a fast, precision internal grinder:

Grouping of operating controls is such that operator's right hand is free to load and unload work.

Closing and opening of collet is entirely automatic . . . operated with a cam and lever arrangement.

A motor driven mechanical differential unit drives the ram in which the grinding spindle is mounted . . . positively eliminates bell-mouth holes. Length of stroke is easily adjusted, making it adaptable to grind shoulder and blind holes; has six speeds, can quickly be slowed with speed control switch for wheel dressing.

Diamond wheel dresser has a micrometer feed, quickly adjusted for automatic hole sizing.

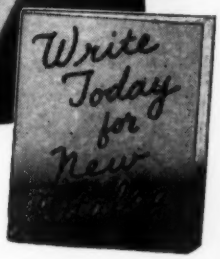
Hardened, ground and lapped ways are sealed against dust.

Feeding mechanism is absolutely free from backlash and is totally enclosed.

Setting up to grind taper and angular holes is simplified by use of a built-in sine bar on the work head (see above close-up).

Dust collecting system draws off all grinding dust, prevents clogging, glazing and adds to wheel life.

All functions are performed mechanically with electric motor power and push button control . . . a separate motor being used for each operation.



Your copy of this new catalog will be sent immediately on request. Write . . . get acquainted with this newer, better method of internal grinding.

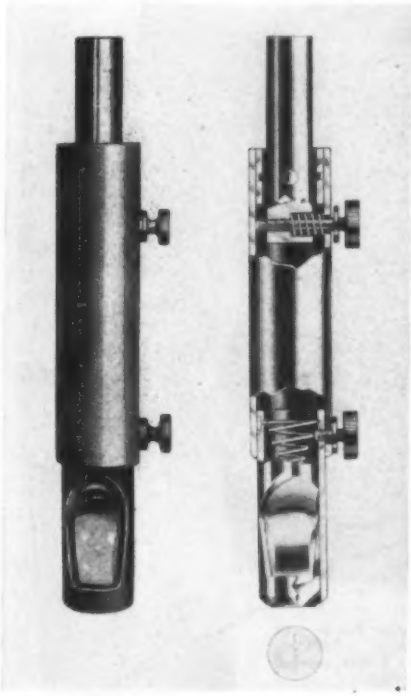
Wilson Machine Products

1231 BEAUFAIT AVE.
DETROIT 7, MICHIGAN

Opti-Locator Aligns Working Layouts to Jig-Bore Accuracy

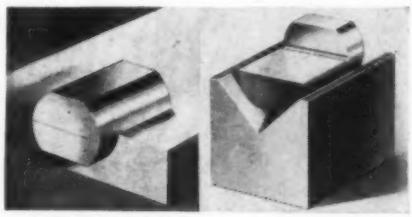
An optical device for use in centering and measuring on all types of machine tools is announced by the Benton Co., 351 S. La Brea Ave., Los Angeles 36, Calif. Primary uses of the Opti-Locator are: Locating layouts, work edges, lines or punch marks to any revolving spindle axis; measuring die cavities or other dimensions inaccessible to mechanical measuring devices; aligning a rotary-table axis to a machine-tool spindle; centering a spindle axis equi-distantly between opposing faces of a V-block for machining circular stock; and locating centers of holes from which measurements are to be taken. The Opti-Locator is constructed to be used on any machine tool with either vertical or horizontal spindle.

The standard ½-in. hardened-steel shank is furnished for chucking with standard collets, tapers or other adapters. Pivoted to the shank by two small ball bearings is a ⅞-in. tubular body which is adjustable laterally by means of a fine-thread line-up screw. This adjustment compensates for any spindle run-out present and assures exact location of axis of rotation.



The spindle aligner of the Opti-locator system is provided with adjustments and a reference reticle to locate the true axis of a spindle

Telescoping within the tubular body is the optical assembly tube, which can be raised or lowered to obtain focus, then locked at the desired height. Focusing is not critical and is accomplished by inserting the spacer provided between work and optical components. Scribe lines, punch pricks or other marks on the work are enlarged and viewed through lenses clamped by spring pressure to the upper prism faces. Images are refracted through the prism and are viewed from the side at a normal reading distance. The effect is the same as sighting a magnified image of the work through the exact center of the spindle. Due to the large optical windows, average room light is generally sufficient for all applications; however, if desired auxiliary light can be directed in either or both optical windows. Machine controls are within reach of the operator at all times.



Datum block is accurately marked to locate edges of working planes and centers of V-blocks

On the botton prism face is scribed a fine interrupted line, which serves as reticle. When the Opti-Locator is put in use, the workpiece is clamped to the table and adjusted by the table controls until one cross-line on the layout coincides with the reticle. All other lines are temporarily disregarded. The spindle in which the Opti-Locator is chucked is then rotated 180°. Any difference is alignment visible through the opposite window indicates total spindle run-out.

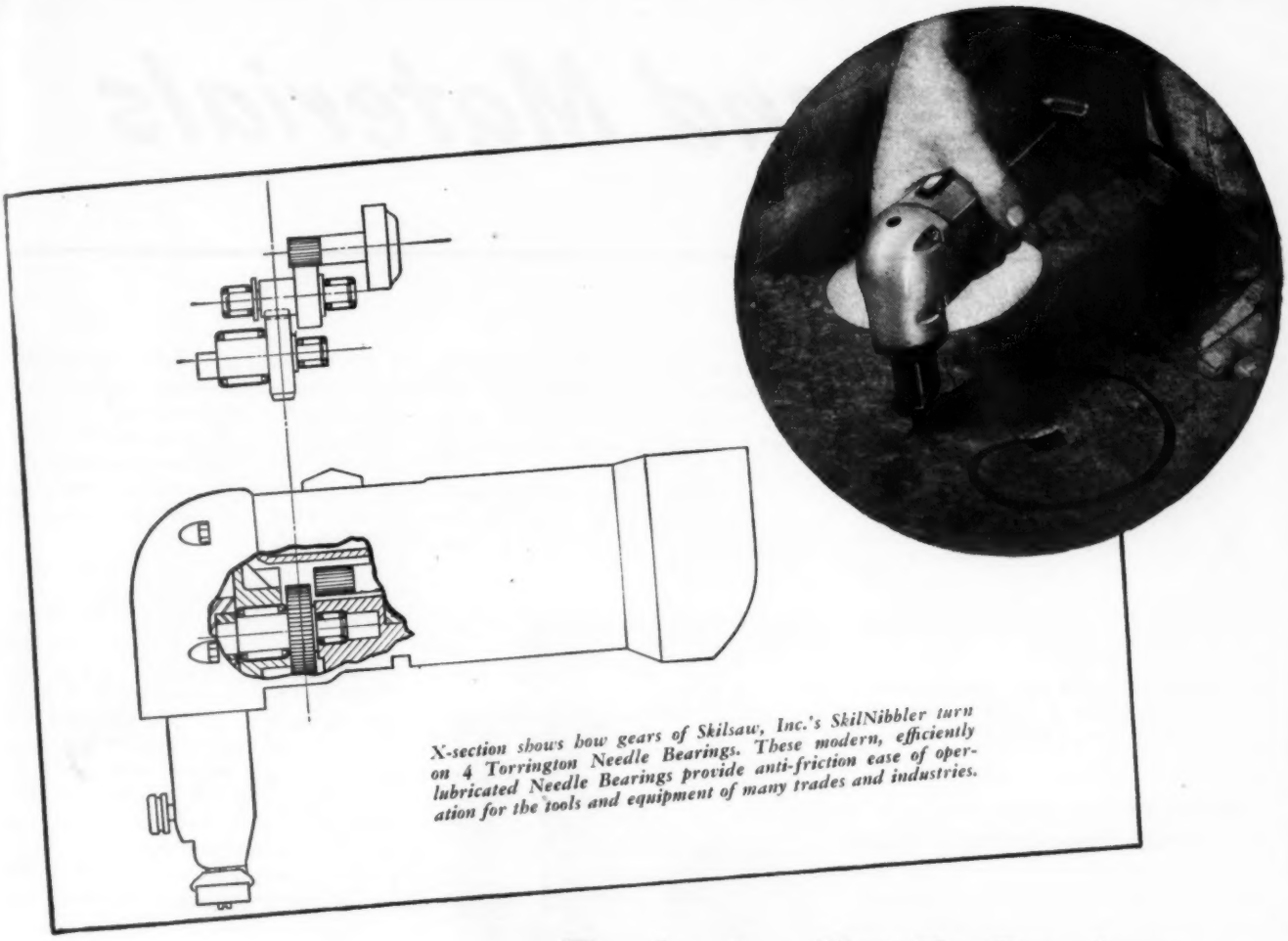
Splitting the total apparent run-out exactly in half by means of the Opti-Locator "line-up" screw locates the exact axis of spindle rotation. Accuracy of this adjustment can be determined by again rotating the spindle 180° and viewing the image. When the reticle and work line coincide when viewed from either window, accuracy is proved and no further adjustment of the Opti-Locator is required. The spindle is then rotated 90° and the remaining crossline adjusted by table movement to coincide with reticle. Centering is thus accomplished from both transverse and longitudinal directions.

With the magnified images, visual centering to an accuracy of 0.0001 in. is possible. The Opti-Locator is removable from the machine for chucking tools without altering machine adjustments. Run-out in the machine does not affect centering accuracy since any spindle deviation follows a true circle, the center of which is located by the Opti-Locator.

Measuring approximately 5 in. long by ⅞ in. O.D., the Opti-Locator can be carried in any tool kit. A cap is provided, fitting over the reticle when not in use, and the instrument is packaged in a round plastic container measuring 1¼ x 5¼ in.

The Datum Block is an accessory which increases utilty of the Opti-Locator. It provides hairlines by which the Opti-Locator can be aligned to any finished edge. It centers V-blocks and similar fixtures to a spindle for machining circular stock and may also be applied with gage blocks for simplifying inspection problems. Since the true axis of any spindle rotation is constant, it can be used as a zero point for measuring. By aligning this axis with any desired starting point, using the Opti-Locator and Datum Block, accurate measurements can be made and set-ups repeated at any time.

The Datum Block is of solid, hardened-and-ground tool steel, having cylindrical sides and measuring 1⅜-in. over-all length by 1-in. O.D. The 1 in. square working surface lies in a plane exactly splitting the central axis of the block. The shoulder drop is approximately ⅜ in., adapting it for use with standard ⅜-in. thick gage blocks. Three surfaces, all in different planes, are scribed for sighting with the Opti-Locator. One hairline is on the top surface in the plane of the shoulder stop; another on the end surface in the plane of the working surface. These two hairlines permit use of the Datum Block in either horizontal or vertical positions for locating edges. A third hairline is on the working surface centrally located between the cylindrical sides. It accurately splits the distance between opposing faces of the vee block, assuring precise centering of a spindle to a V for machining circular stock.



X-section shows how gears of Skilsaw, Inc.'s SkilNibbler turn on 4 Torrington Needle Bearings. These modern, efficiently lubricated Needle Bearings provide anti-friction ease of operation for the tools and equipment of many trades and industries.

Torrington Needle Bearings Help Increase Performance of Portable Tools

Portable electric tools must be lightweight and compact, yet engineered to stand up to long and hard usage. Thus it is only natural that many moving parts of the more widely-sold tools... the gears of Skilsaw, Inc.'s popular "SkilNibbler," for instance... turn on Torrington Needle Bearings.

"We've used Torrington Needle Bearings in our tools for nine years," writes E. W. Ristau, Vice President of Skilsaw. "We like their high load capacity, their small size and light weight, their ease of lubrication and maintenance, their low cost, *and their excellent anti-friction performance.*"

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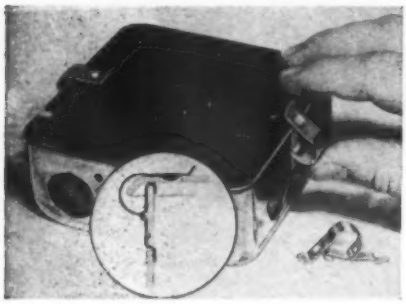
Parts and Materials



Tinnerman clips for junction-box covers provide a quick access to wiring for checking circuits

Tinnerman Box Covers Clips Permit Quick Access to Wiring

This spring-steel fastener for box covers, manufactured by Tinnerman Products, Inc., 2113 Fulton Rd., Cleveland 13, Ohio, eliminates all screws, nuts and rivets, as well as tools for attaching. The clip is self-retaining and need only be snapped by hand into pre-punched holes in the sides of the box. It is light weight and installed quickly. By flipping the clips into locked position, the cover is held firmly in place. To remove the cover, the clips are unsnapped by pushing them back with the thumb. These clips are entirely outside of the box, with nothing inside to obstruct or damage wires or other equipement.

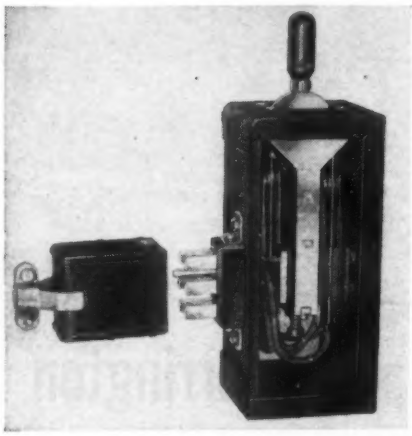
Available for use on sheet-metal, die-cast, plastic or plywood boxes of varying wall thicknesses.

Mossman Lever Switch is Keyed For Easy Removal and Servicing

The 4101-KP extra-heavy-duty lever switch, manufactured by Donald P. Mossman, Inc., 612 N. Michigan Ave., Chicago 11, Ill., for starting and plugging motors, is removable and permits servicing without the shut-down of more than a single motor together with the added factors of increased safety and freedom from dirt and dust because of a special housing.

The switch is rated at 20 amp., 110 volts, a.c. (non-inductive). Its size is approximately 2⅜ x 2⅜ x 5¼ in. Mounted in a metal box and wired to the terminal plug, cable socket is supplied, or a plug may be placed on the housing.

The number of contacts depends upon the number of wires in the control cable. The connector used



The key plug connections of the Mossman switch permit quick substitution of a standby switch whenever servicing is necessary

is a standard plug or socket with locating pins for easy connection.

The handle is of plastic, with a metal ferrule and locking set screw for strength and safety. A cover forms a dust-proof enclosure.

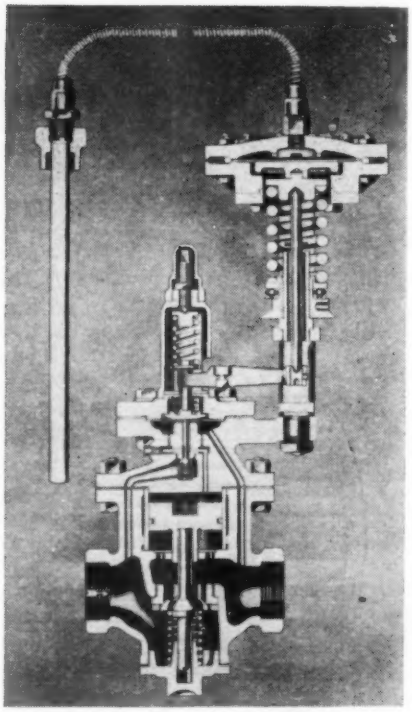
Leslie Temperature Regulator Provides Duo-Matic Control

A self-contained, spring-loaded, internal-pilot, piston-operated temperature regulator for steam service is manufactured by Leslie Co., 129 Delafield Ave., Lyndhurst, N. J. A feature of the regulator is a control system whereby both accurate temperature regulation and pressure control are obtained simultaneously.

The regulator has a thermostatic element with 100-F. adjustable temperature range. It is single-seated for positive dead-end control. It is equipped with metal diaphragms and has no bellows or glands.

All wearing parts are renewable. Full interchangeability allows complete overhaul without removal from the pipe line. Corrosion and wear resistance are obtained through use of stainless-steel hardened wearing parts. Vital parts are hardened to 500 Brinell.

A vapor-filled thermostatic element acting through the upper diaphragm and lever opposes the pressure-limit spring and determines the steam pressure delivered by the regulator to the heat exchanger. Manual compression of the limit spring determines maximum outlet pressure and opens the control valve, admitting high-pressure steam from the inlet-body port to the top of the piston which opens the main valve. Outlet steam pressure, acting under the steam diaphragm, balances the



Outlet steam pressure from the Leslie regulator is always directly proportional to the change in temperature at the bulb, and this pressure is automatically maintained regardless of the volume of steam or variations in supply pressure

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The green light in metals... Revere has them NOW

Revere knows well how precious to the nation each of these post-war days can be, and how crippling to industry and employment could be a shortage of essential metals. That is why, since V-J Day, Revere has been in full production for peace.

Fortunately, Revere metals can serve the needs of creating as well as those of destroying, can make as fine bathroom fixtures as bomb fuses, as excellent radiators for automobiles as for half-tracks. No difficult reconversion problems have stifled the outpouring of Revere metals.

Revere copper, brass, bronze, aluminum, magnesium, steel, are ready *now*, are already busy in thousands of plants helping shorten the period of reconversion for industry and for the nation.

We are able and eager to do more. One inevitable result of Revere's war effort has been that not only our ability to produce, but our ability to give service, have been expanded many times. Revere research has probed further and deeper. Revere Technical Advisors are armed with greater knowledge and experience. New methods, metals and machines may save precious time or cut all-important cost for users of our metals.

In all these ways Revere is ready *now* to serve the manufacturing and building industries to help you prove *immediately* that America is even greater in peace than she proved to be in war. In the same way Revere is ready to serve home owners with its building products which are stocked by Revere Distributors in all parts of the country.

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Philadelphia, Pa.	Pittsburgh, Pa.	Providence, R. I.
St. Louis, Mo.	San Francisco, Calif.	Seattle, Wash.

The Revere Office nearest you is at your service.

compression of the limit spring, throttling the control valve and limiting the maximum outlet pressure.

The temperature at which the vapor pressure starts to oppose the limit spring and decrease outlet steam pressure is set on the adjusting spring. This spring opposes the vapor pressure through the large upper diaphragm and, by means of this spring, the temperature at which all steam to the heater will be shut off can be accurately set. A temperature drop of 1 F. at the bulb reduces the vapor pressure, allowing the limit spring to open the control valve and deliver increased steam pressure to the heat exchanger.

Zurn Safety Vents Prevent Flash-Backs to Storage Tanks

The J. A. Zurn Mfg. Co., Erie, Pa., has developed safety vents with a rupture diaphragm which gives protection against fire and explosion to tanks and processing vessels containing flammable liquids.

These units give double protection, in that they are a combination vapor valve and rupture diaphragm. They contain a diaphragm that will break to relieve excessive pressures which build up within a storage tank. Thus, by permitting the escape of unusually high pressures, they reduce danger from explosions to a minimum.

Zurn safety vent prevents flames from flashing back through the perforated vent plates into a tank where flammable liquids might be ignited

In addition to the rupture diaphragm, these units have the ordinary function of permitting a safe escape of flammable gases from a tank. This is accomplished by means of a unit with perforated-brass flame-barrier plates.

Tool-Steel Tubing Reduces Boring in Hollow Components

Tool-steel tubing, which eliminates boring operations in the manufacture of drill and liner bushings used in drill jigs and boring fixtures, is a product of the Bissett Steel Co., 945 E. 67 St., Cleveland 8, Ohio. The material is used for bushings in cases where small standard bushings are not immediately available, or where bushings of large and unusual sizes are required. It is available in sizes from 1 to 15 in. O.D., with a wide range of wall thicknesses.

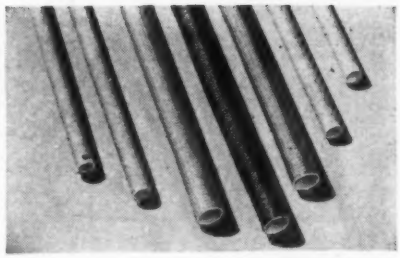
Tool-steel tubing is made of an oil-hardening, non-shrinkable tool steel which is easy to heat-treat and non-sensitive in the process. It attains hardnesses in excess of 60 Rockwell C. It can be used for cutting tools, for dies, punches, collets, collet closers, spindle thrust collars, lead-screw thrust collars, crushing rolls and other hardened rolls, ring gages, slitters, spacers, skiving knives and machine-tool parts.

The sleeve, expansion collars and expansion nut of this expanding arbor are made of tool-steel tubing

Brand Glass-Sleeve Insulation Resists Heat, Arcs and Fluids

In the varnished glass tubing developed by William Brand & Co., 276 Fourth Ave., New York 10, N. Y., the salient feature is the varnish impregnation, claimed to be completely resistant to cracking, regardless of the angle of bend, or the time period to which it is subjected to such bending.

This form of insulation is unaffected by transformer oils, thinners, gasoline and tetrachloride, and is constituted to resist most electrochemical influences.

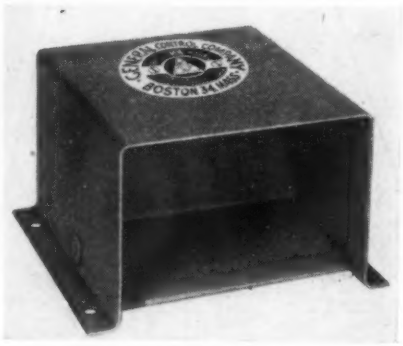


This varnished fibrous glass tubing has a high dielectric value, low moisture absorption factor and is resistant to heat and acids contiguous to soldering operations

It meets all the standards established by the American Society of Testing Materials, and is available in various colors, in standard bundles of 42-in. strands.

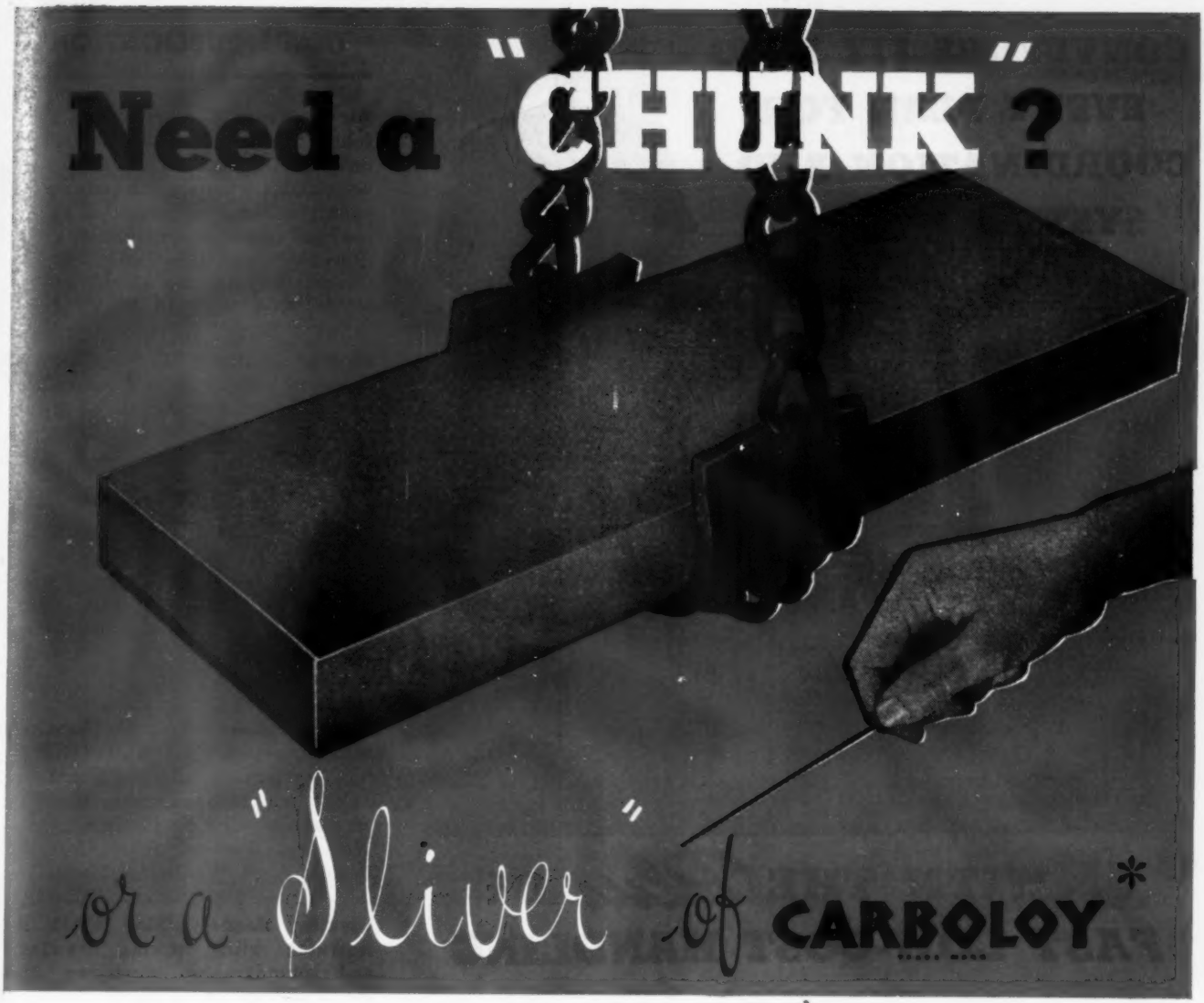
General Control Foot Switch Minimizes Operator Fatigue

The Model MK foot switch developed by General Control Co., 1200 Soldiers Field Rd., Boston 34, Mass., is especially adapted for light machining operations, photo printing, communications equipment or similar applications. The treadle is 1/8 in. from the floor and requires 1/16-in. throw to trip the switch. The entire toe treadle is covered by a welded steel housing, thus making the switch safe from accidental actuation. This model is made in one type with a single pole, normally open, Acro switch element.



Short stroke required for operation of the MK foot switch and recessed pivoting increase safety factor

The foot switch is made of welded steel throughout, and is finished in baked enamel. Four holes are provided in the flanged base for mounting to the floor.



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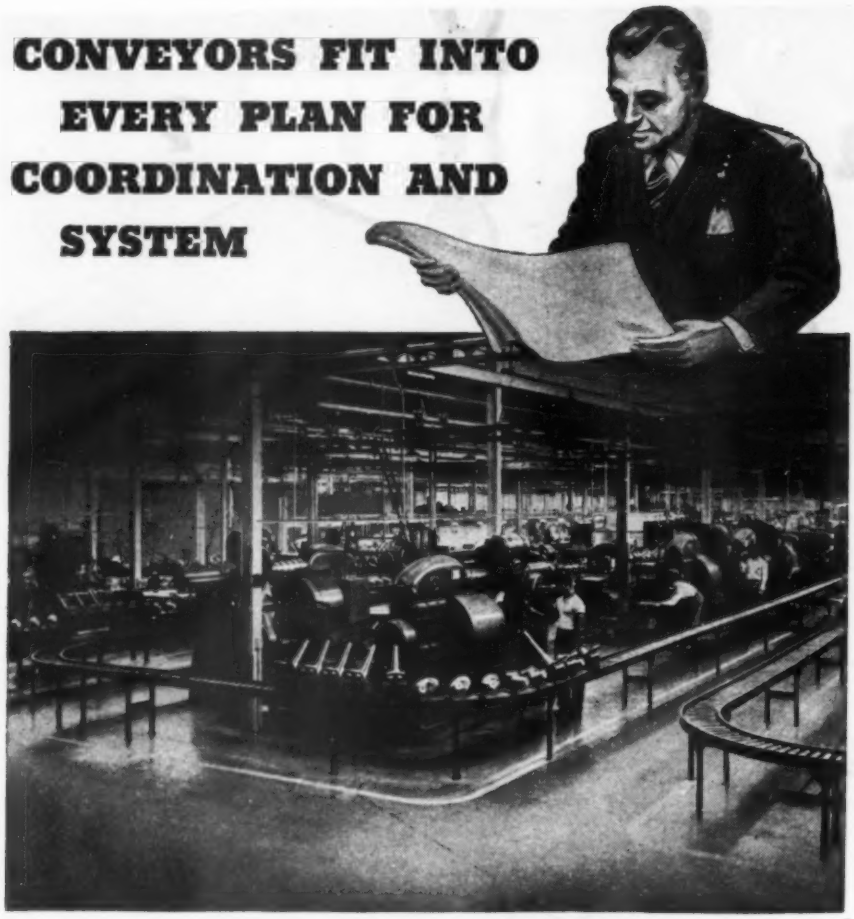

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TRADE PUBLICATIONS

Air Recovery Equipment—In a file folder entitled "Air Recovery-Fuel Saving" Dorex systems, employing activated carbon as an adsorption agent for the elimination of vaporous and gaseous contaminants, are described and illustrated. W. B. Connor Engineering Corp., 114 E. 32 St., New York 16, N. Y.

Blowers—Bulletin 745 describes features of high-pressure axial-flow blowers that operate at ⅜ to 100 in. of water up to 100,000 cu. ft. per min. Buffalo Turbine Corp., 2165 Bailey Ave., Buffalo 11, N. Y.

Copper Alloys—28-page illustrated bulletin No. 71 covers products, and points out applications of Ampco metal and Ampcoloy bronzes. Methods of fabricating are discussed. Ampco Metal Inc., Burnham & 38 St., Milwaukee, Wis.

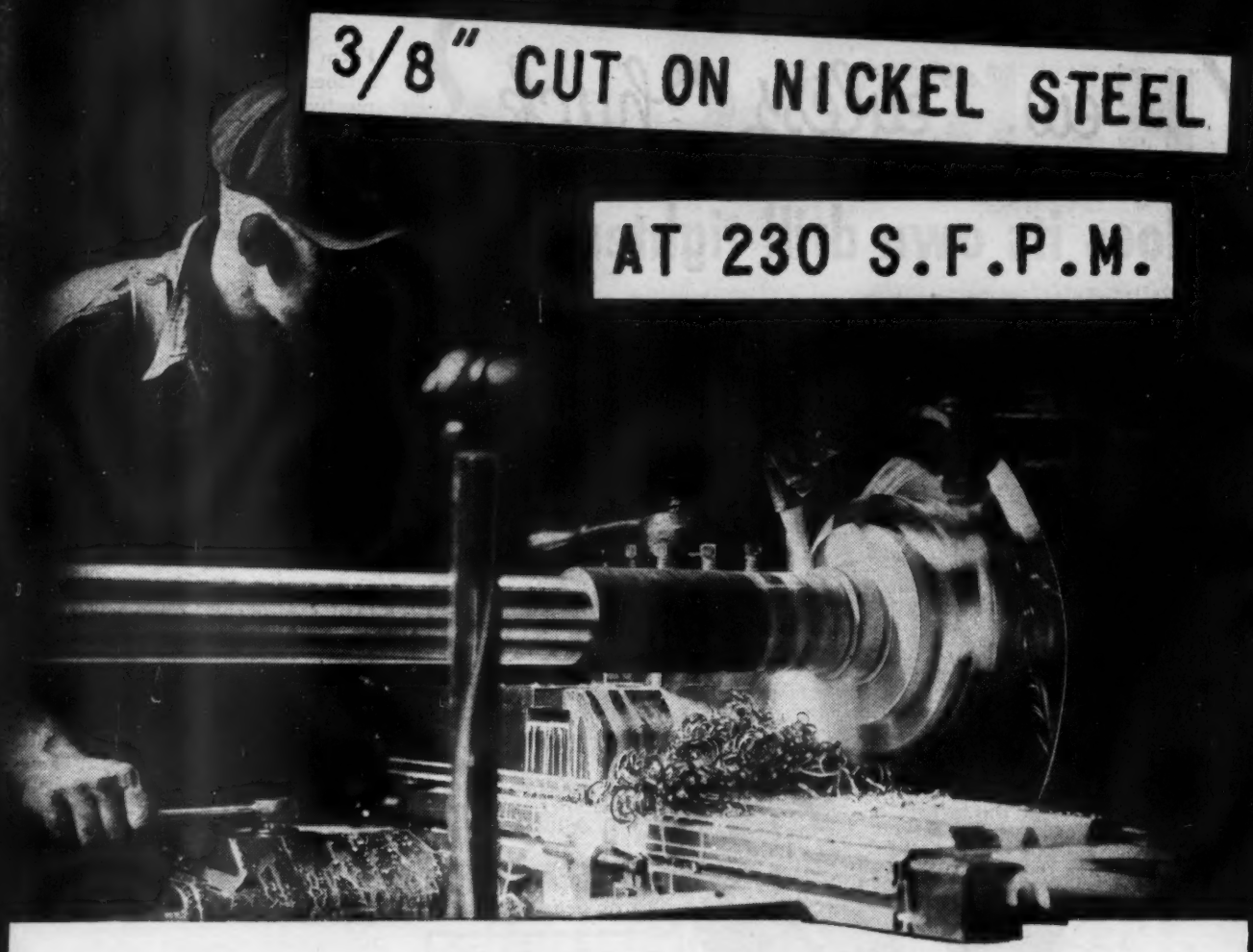
Deep Drawing—8-page illustrated methods article by J. Walter Gulliksen, mechanical engineer, contains design, material and processing data on deep drawing magnesium domes. Worcester Pressed Steel Co., 101 Barber Ave., Worcester, Mass.

Dividing Head—Catalog WA12, illustrated with working drawings and photographs, describes the model K universal spiral dividing head and contains instruction for its operation. Kearney & Trecker Corp., Milwaukee, Wis.

Files—8-page illustrated catalog of milled curved-tooth files shows complete range of types, sizes and cuts authorized by WPB. These files are recommended for use on ferrous and nonferrous metals, especially softer metals including aluminum, brass, solder and babbit. American Swiss File & Tool Co., 400 Trumbull St., Elizabeth, N. J.

Flexible Shafting — Remote control of valve systems by means of spiral-cased flexible-core shafting is demonstrated and specifications given for installation arrangements. Stow Manufacturing Co., Binghamton, N. Y.

Fluid Couplings—4-page illustrated bulletin No. 107 describes in detail use of this coupling in solving problem of disconnecting liquid-carrying lines without customary need for draining system and priming after



SUNOCO EMULSIFYING CUTTING OIL . . .

Proves Its Worth Under Severe Operating-Conditions, Lengthens Life of Tools, Cuts Down Re-Grindings

When heavy cuts and heavy feeds are being taken on nickel steel . . . and peak production is to be achieved . . . it is essential to maintain accurate cutting-edges with long intervals between grinds.

Here is a case where a manufacturer's preference for Sunoco Emulsifying Cutting Oil is based on that type of performance.

Operation	Rough turning forged spindle
Machine	Monarch 20" Model "M" engine lathe
Material	S.A.E. 2350
Surface Cutting-Speed	230 feet per minute
Depth of Cut	⅜"
Feed per Revolution	.015"
Type of Tool	Tantalum Carbide
Cutting Lubricant	1 part Sunoco to 10 parts water

Sunoco has won the approval of leading machine-tool builders and metal-working plants for its outstanding work in a wide variety of tough metal-cutting operations like this on alloy steels, forgings, and other jobs where carbide tools are indicated.

The outstanding lubricating, heat-absorbing, and rust-preventive qualities of Sunoco make possible longer runs between regrinds, greater accuracy, better finish, fewer rejects, and worthwhile savings in production-time. Let a test, run on Sunoco in your own plant, under your own operating conditions, convince you.

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New Keyless Chuck
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THE TURNER CHUCK Saves Time!

Hardened bearing steel roller jaws grip the drill without chewing or scoring.

Grip is automatically and progressively strengthened with increased load pressure

Ball bearings increase life.

Absolutely KEYLESS. No more chewed drill shanks. No more time wasted looking for keys.

The Turner Chuck is self-energizing. Tightens itself by the action of the drill.

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THE SINGLE STYLE TURNER CHUCK IS AVAILABLE IN:

4 DRILL CAPACITIES	3 BODY SIZES
A-1/32 to 1/16 DRILL	15/16 x 1¾
B-1/16 to ⅛ DRILL	15/16 x 1¾
C-⅛ to ¼ DRILL	1½ x 2½
D-¼ to ½ DRILL	2¼ x 3¾

reconnection. Aeroquip Corp., 303 S. East Ave., Jackson, Mich.

Form Rolling—Bulletin TR-45 describes the operating principles and mechanical details of the TR-1 thread and form rolling machine. Line drawings and photographs illustrate the facilities of the triple-roll hydraulic machine. National Acme Co., Cleveland 8, Ohio.

Furnaces—Catalog 108 describes furnaces for hardening, annealing, brazing, heat-treating and melting. Included is a section devoted to furnace atmosphere control, recommended atmospheres for standard brands of steel and manometer tables for various gases. C. I. Hayes Inc., 75 Baker St., Providence, R. I.

Furnaces—Catalog 413E, 413L, 413G and 417, describe, in detail, gas, oil and electrically operated industrial furnaces, ovens and dryers. Photographs and line drawings illustrate the material. W. S. Rockwell Co., 50 Church St., New York 7, N. Y.

Gages—Precision fixtures are illustrated in a folder which also contains a description of the Lundgren Laboratory method of comparing size blocks with master standards to accuracy of one-millionth of an inch. AA Gage Co., 350 Fair St., Detroit 20, Mich.

Hydraulic Presses—Illustrated leaflet describes features of Basic Multipress, Multi-Speed Multipress and Vibra-Press Multipress units. Denison Engineering Co., 1186 Dublin Rd., Columbus, Ohio.

Lathe — Specifications, descriptions and accessories for Model 4-123 precision instrument lathe are presented in a 4-page brochure. Gilman Engineering Works, Janesville, Wis.

Metallizing—Circular F-1-A gives complete information on construction, spraying speeds and gas consumption of the Model F Mogul metallizing gun. Exploded views of gun parts and photos of equipment illustrate operation. Metallizing Company of America, 1330 W. Congress St., Chicago, Ill.

Milling Machines—Supplement M-1418 contains technical information on specifications, capacities and sizes of new or revised models of Cincinnati milling, broaching and cutter sharpening machines. Cincinnati Milling and Grinding Machines Inc., Cincinnati 9, Ohio.

Plating—Folder describes fully automatic machine for production plating. Features compact arrangement, hydraulic tank transfer control and standard replacement parts. Udylite Corp., 1651 E. Grand Blvd., Detroit 11, Mich.

Precision Drills—4-page illustrated folder No. 50M contains complete data, prices and dimensions of high-speed micro-precision and watchmaker drills which can be used at speeds of 2,500 to 10,000 r.p.m. or higher depending upon machinability of materials being drilled. Chicago-Latrobe Twist Drill Wks., 417 W. Ontario St., Chicago, Ill.

Press—Catalog gives specifications, capacities and other informative details of portable hydraulic presses for heavy-duty pulling and pushing. Attachments and adaptations for specific uses are illustrated. Rogers Hydraulic Inc., Minneapolis 16, Minn.

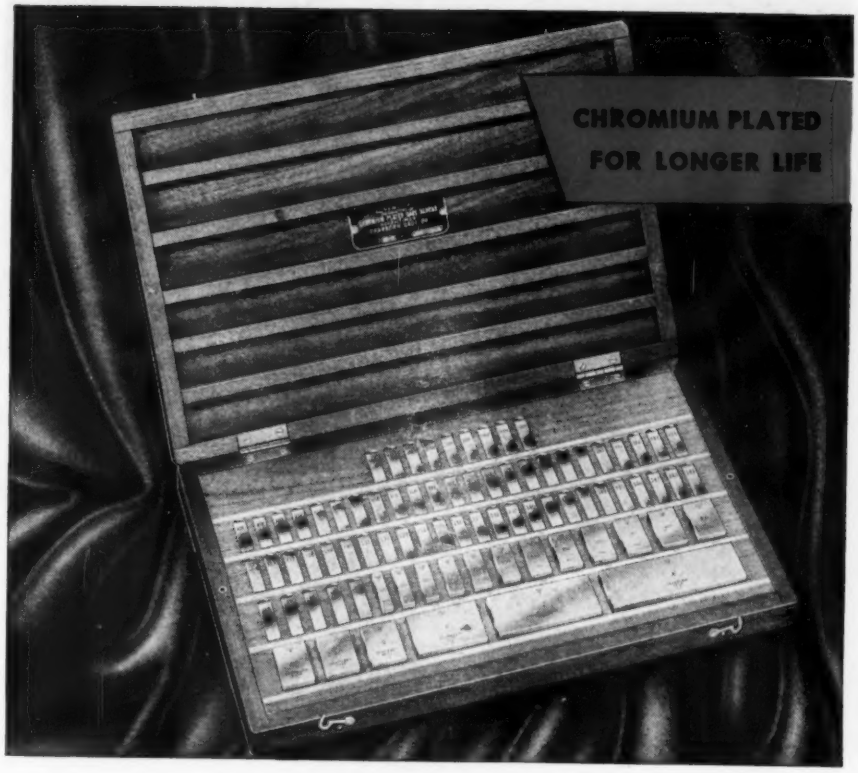
Process Control—20-page technical paper No. 100 contains proposed A.S.M.E. definitions of process control terms with illustrations. Askania Regulator Co., 1603 S. Michigan Ave., Chicago, Ill.

Resin—24-page illustrated booklet "Melamine" describes applications of chemical melamine in plastics, textile, paper, leather, chemical, paint and allied industries. American Cyanamid Co., 30 Rockefeller Plaza, New York, N. Y.

Safety—A folder, that employs the services of a nonchalant cartoon character to illustrate what not to do to a grinding wheel, expounds the common-sense principles involved in the care and treatment of abrasives. Sterling Grinding Wheel Division, Tiffin, Ohio.

Shot Cleaners—12-page illustrated catalog No. 204 "The Wheelabrator Plain-Table" describes unit recommended for blast cleaning a wide variety of flat, fragile work with few pockets and high vertical edges. Specifications, method of operation, electrical specifications, floor layouts and performance results are covered. American Foundry Equipment Co., 451 S. Byrkit Sts., Mishawaka, Ind.

Silicate—12-page illustrated booklet No. F-5989 discusses hydrolysis of ethyl silicate and its use as a source of silica. Principles of the hydrolysis and typical formulas are included. Applications as a bonding



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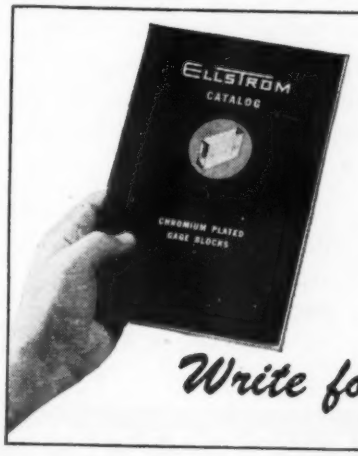

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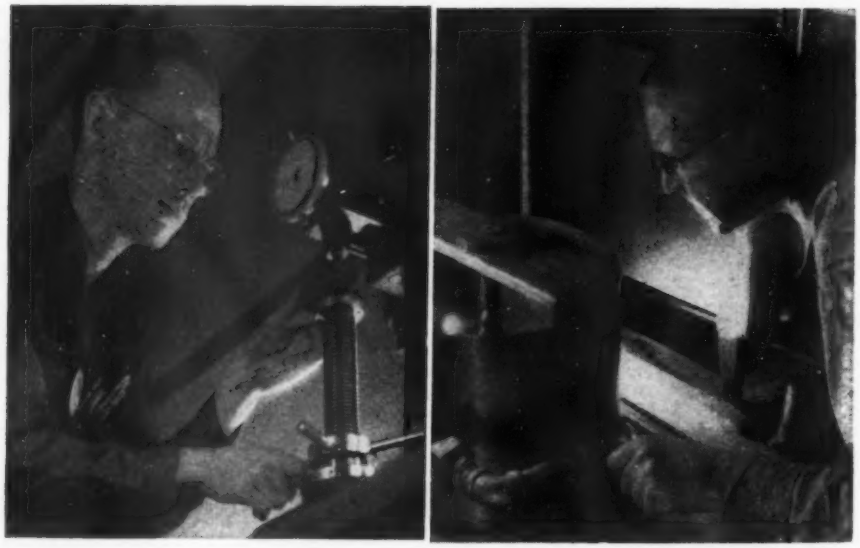

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agent and as a preservative and weatherproofing agent are covered. Carbide and Carbon Chemical Corp., 30 E. 42 St., New York, N. Y.

Stainless Steels—Physical, electrical, thermal, mechanical and working characteristics of 21 different analyses of stainless steels are given in "Characteristics of Rezistal Stainless Steels." Crucible Steel Company of America, 405 Lexington Ave., New York 17, N. Y.

Steel—4-page illustrated data sheet No. DS115 is descriptive of Ketos oil-hardening tool steel which can be used in manufacture of blanking, coining, drawing, forming, plastic mold, thread rolling and trimming dies as well as gages, broaches, paper knives and taps. Crucible Steel Co. of America, 1100 Chrysler Bldg., New York, N. Y.

Tables—Four tables, consisting of decimal equivalents, decimal sizes of twist drills, machine screw thread dimensions and one of machine screw weights per thousand pieces, are inclosed in a pocket-sized envelope. Manufacturers Screw Products, 295 W. Hubbard St., Chicago, Ill.

Tubing Tools—Folder No. 347 describes cutting, flaring, binding, soldering, pinch-off, swedging, reaming and refacing tools, all hand-operated, for copper, brass, aluminum or thin-wall steel tubing. Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago 7, Ill.

Variable-Speed Transmission—Bulletin 508 describes the operation and construction principles of a metallic traction type transmission in which a condition of complete slip, in event of overload stall, is physically impossible. Horsepower, torque and speed ranges are given in chart form. Graham Transmissions Inc., 3754 No. Holton St., Milwaukee, Wis.

NEW BOOKS

CARE AND USE OF HAND TOOLS—*By Raymond R. Toliver. 93 pages. Published by John Wiley & Sons, Inc., New York. Price, $1.25.*

Most of the information contained in this book was prepared for training green employees at the Boeing Wichita plant. Later the book was rewritten to make it suitable for in-

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struction of high-school shop classes and pre-production industrial training classes. Subjects covered are: vises, hammers, cold chisels, files, screwdrivers, hacksaws, pliers, wrenches, machine-screw taps, drilling, reaming, measuring tools, micrometers, and exercises for the chapters.

•

ESTABLISHING AND OPERATING A METAL-WORKING SHOP — *Prepared by the Department of Commerce. 200 pages. Copies are available at 35c each from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., or any field office of the Department of Commerce.*

•

Written for the guidance of those who plan to establish enterprises of their own, the book was prepared with the cooperation of various authorities in the metal-working industry and covers general repair and service shops, welding shops, sheet-metal working shops, ornamental iron works, combination shops and mobile shops.

All factors connected with the establishment and operation of a metal-working shop are discussed—choice of location, capital investment, organization of the business, type of building and layout, sources of business, credits and collections, record keeping and other items. Pitfalls to be guarded against are indicated clearly.

•

UNDERSTANDING LABOR. *By Bernard H. Fitzpatrick. 179 pages. Published by the McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 18, N. Y. Price $2.50.*

Within its limited number of pages, this book offers an amazing wealth of information and discussion making for a better understanding of labor. Taking neither a pro-labor nor an anti-labor attitude, the author pursues a neutral path in his discussion of the popular arguments, concepts and misconceptions about labor matters. The Wagner Act, the Railway Labor Act, and the historical development of the labor movement are covered to help provide the reader with a solid background against which the pattern of current labor-management relationships may be studied. The book is highlighted by interesting illustrations of labor incidents, including strikes and lock-outs, to drive home

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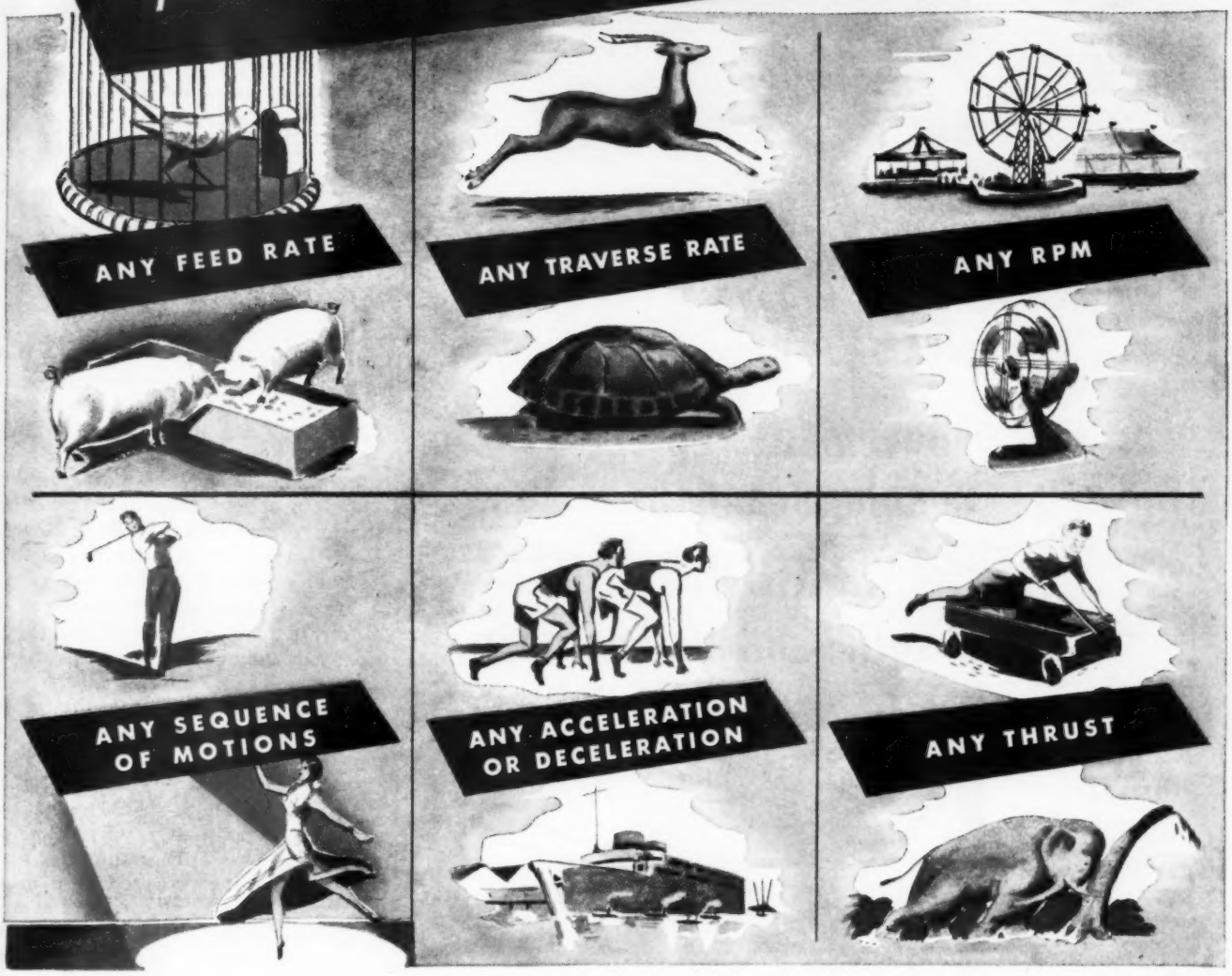

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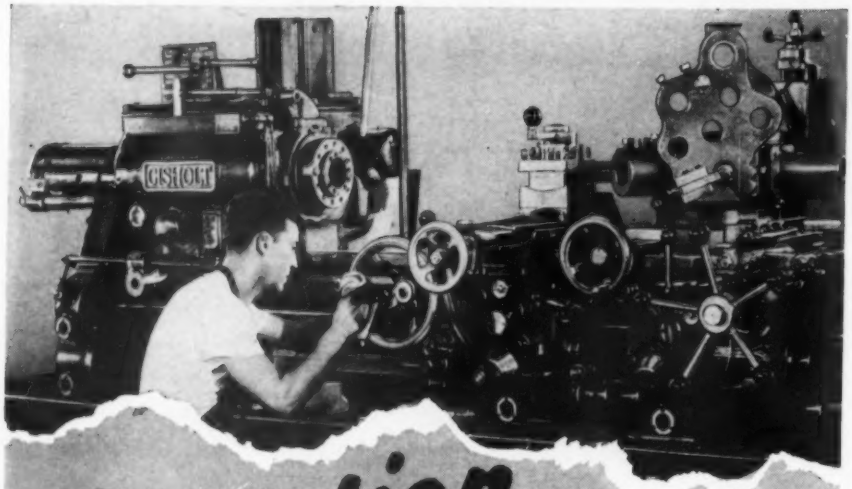

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Consider these advantages:

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the falsity of certain contentions dissected by the author or to strengthen the force of his arguments. An outstanding chapter analyzes the pros and cons of the closed shop, wherein the author stamps the union in such cases as a "lame-duck" representative of the workers, as its responsibility to the electorate is thereby destroyed. On the other hand, management is roundly scored in historical cases where it was at fault.

SEEN and HEARD

By JOHN R. GODFREY

Gas Turbines

AIRCRAFT ENGINES have moved ahead so fast in the past few months that one naturally wonders how the post-war commercial plane will be driven. Jet propulsion has received a great deal of publicity and has intrigued the imagination of a public which had a prophetic taste of rocket ships from comic strips like Buck Rogers and the pseudo-scientific stories that have appeared in magazines.

A cool appraisal by a supplier of aircraft fuels (Standard Oil Company of Indiana) however, points to the conclusion that jet planes will probably not come into ordinary use for private or commercial purposes for a long time, if ever.

A jet plane must fly high and fast. Altitude and high-speed flights are expensive no matter what kind of engine is used. For a number of reasons, including fuel economy, it is predicted that most commercial flying will be at speeds less than 300 miles an hour and at altitudes below 20,000 ft. While jet engines may burn fuels slightly cheaper than gasoline, they are apparently going to be more critical of their diet than was at first supposed.

It is likely, however, that the piston engine may lose much of its present superiority. Experts feel that the large airplane of tomorrow will use propellers, but that they will be driven by gas turbines. Turbines may be held back for a time because they use more fuel than the highly perfected modern piston engines; but their advantages should eventually enable them to supplant present engines. As the size of engines go up the turbine offers fewer design problems, gives simpler construction and is, in general, easier to maintain.

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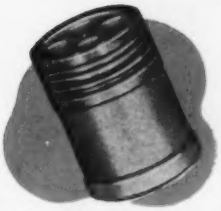

This piston has 9 critical dimensions. Both upper and lower limits of every dimension have to be checked.

This part could be checked by 9 inspectors (one for each dimension) using fixed size gages. Each inspector would then need two gages: one for the GO limit, one for the NO GO limit. That means two operations for each dimension—or 18 operations in all.

With a Multichek one operator inspects *both* limits of *all* dimensions in just one pass, and about as fast as 9 inspectors can check simultaneously one limit of any single dimension. Inspection cost is reduced to a mere fraction of the cost by any other method—pennies per piece.

That's not all. The Multichek, because of its inherent mechanical accuracy and positive electrical speed, eliminates the element of human error. No highly developed sense of feel is required to check to a high degree of accuracy. Furthermore, full manufacturing tolerances may be utilized. Multicheks may be used at the machine to control the process, to tell the operator "where he is" and which way "the machine is going"—or they can be used at any inspection station.

May we analyze your requirements and quote on Multicheks for checking from two to twenty or more dimensions simultaneously in one quick pass, thus reducing production costs to a minimum.

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Submit your blueprints or specifications for recommendations. Often a slight design modification suggested by Acme engineers reveals unsuspected possibilities for a change to aluminum castings, with its many advantages. And there's no obligation.

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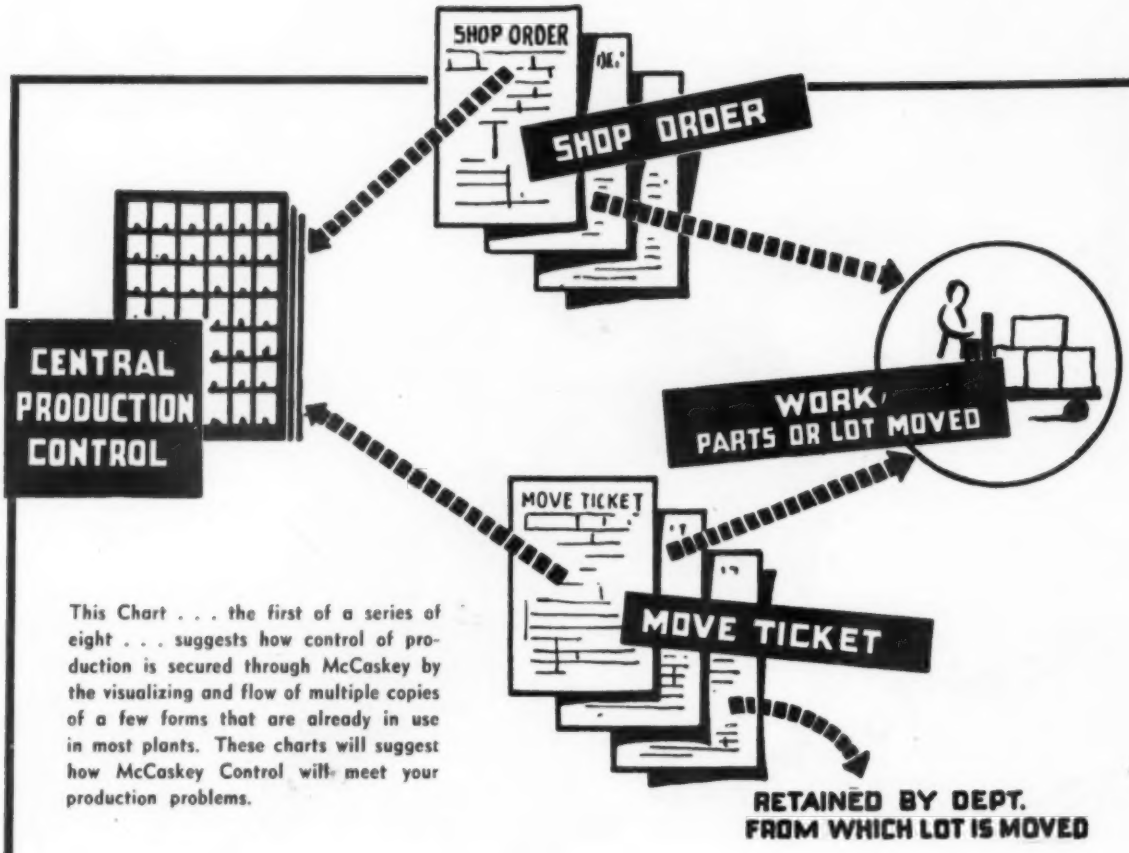

This Chart . . . the first of a series of eight . . . suggests how control of production is secured through McCaskey by the visualizing and flow of multiple copies of a few forms that are already in use in most plants. These charts will suggest how McCaskey Control will meet your production problems.

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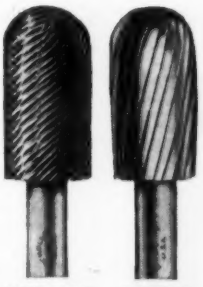

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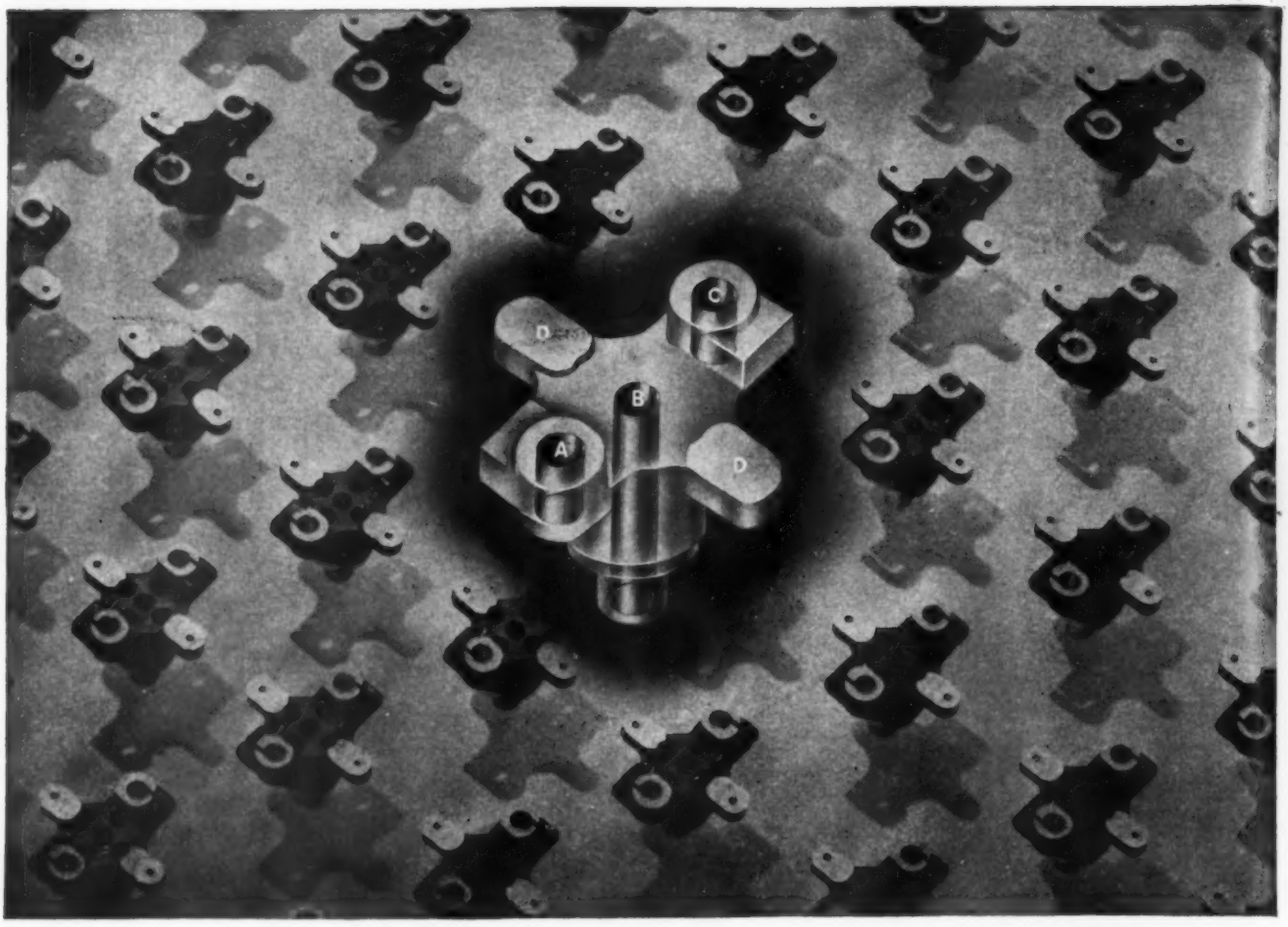
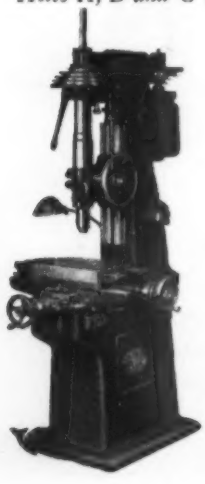


How to use the *Moore Jig Borer* as a Production Machine

Three holes located and sized, two pads milled—in a single set-up; 5,000 aluminum parts—6 minutes each. Are you limiting the capacity of your jig borer by using it only on toolroom work? You needn't...if it's a Moore Jig Borer.

For this versatile machine not only adds toolroom accuracy to your production jobs but often outperforms special-purpose machines. Here's proof on a run of 5,000 aluminum parts:

Holes A, B and C were located to a tolerance of .0005", sized to + .0005",—.0000"...had to be parallel to .001" checked on plugs 1" long...two pads D milled to ±.001".



In order to hold these pads in close relation to the holes, the job was done in a single set-up.

A drill jig couldn't handle such close tolerances; reamers and bushings would wear. Since aluminum is not free-machining, a good finish would be difficult to obtain with reamers.

The only answer was single-point boring. After the holes were roughed out with a jig costing $75, the Moore Jig Borer machined them to exact location and size. The entire operation, including the machining of the two pads, required only six minutes each and reduced appreciably all previous costs.

Such speed and accuracy are the result of the Moore Jig Borer's sensitive spindle which provides speeds to 2,600 RPM, and quick-setting lead screws. The latter, ground to an accuracy of .0002" in 16", enables you to spot, drill, bore and ream holes in one set up, with minimum tool changes.

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MOORE TOOLS

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5400 per hour WITH TOCCO

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TOCCO electrical induction heats the seat only to a uniform depth. TOCCO's integral quench then cools the area, hardening it to 60 R.C. This quick, localized treatment avoids scaling and distortion, and does not disturb the nearby braze. The quality of the result is attested by millions of these tappets now in service.

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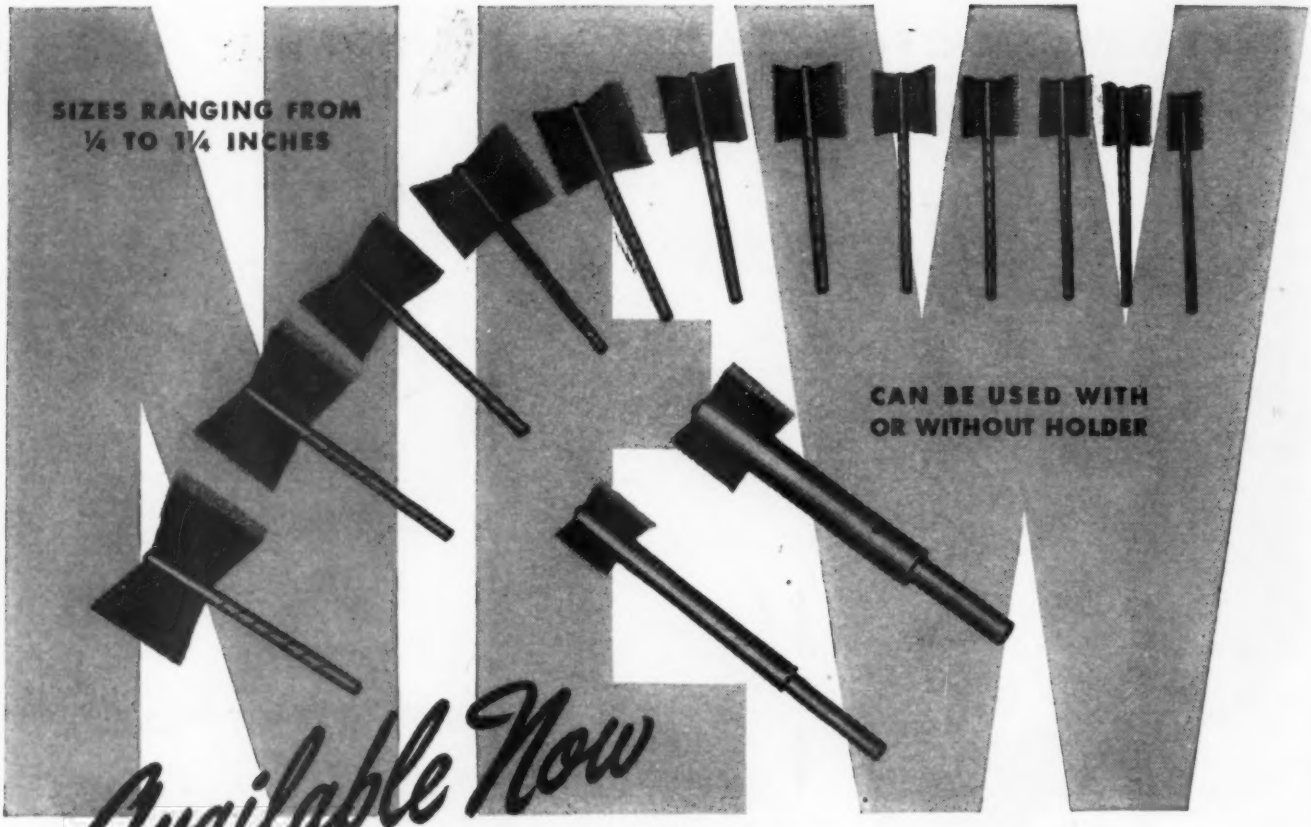

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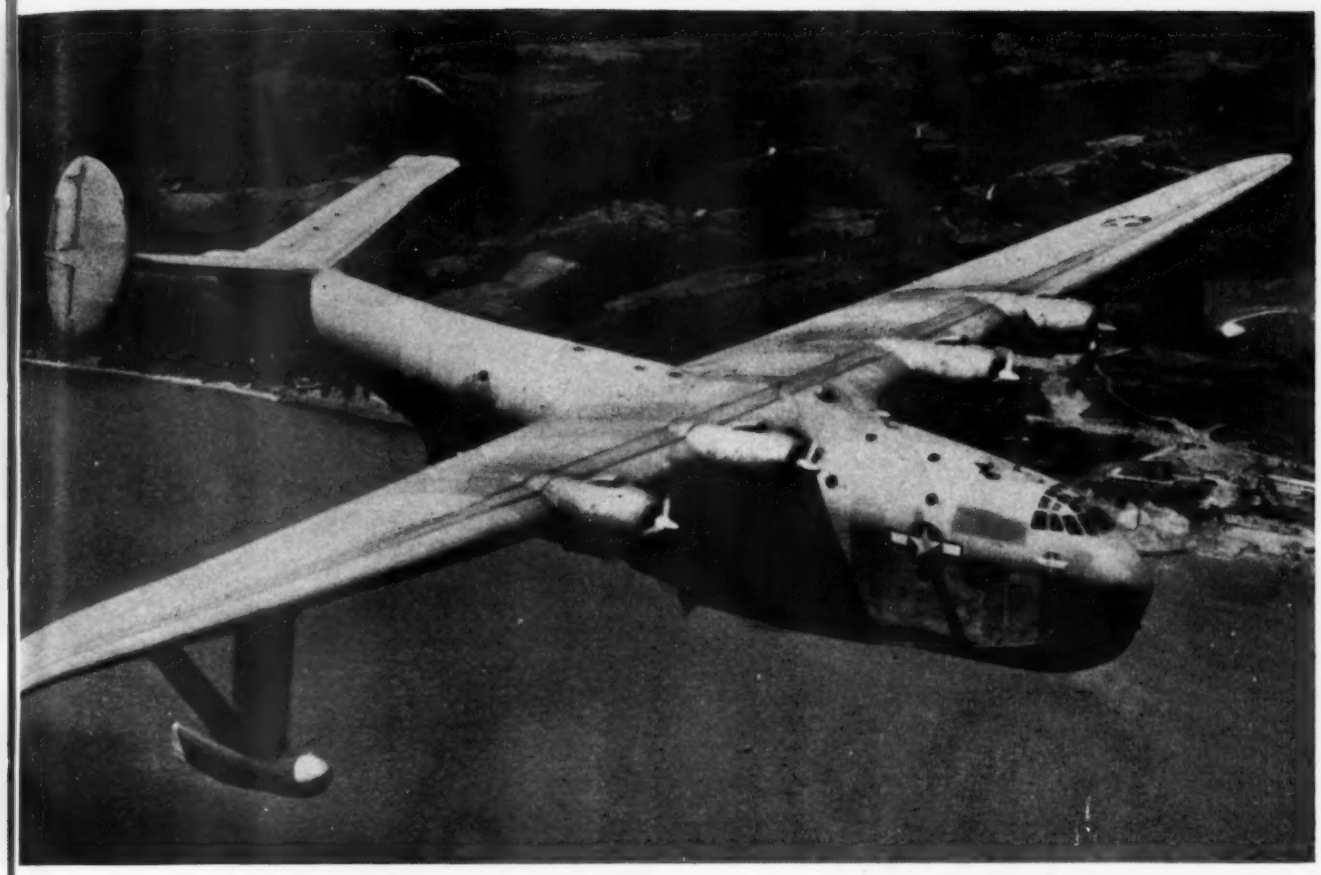
Osborn Brushes

WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY



Photograph courtesy the Glenn L. Martin Co., Baltimore, Md.

85 OUT OF 100!

IN building the giant "Mars" flying boat, the Glenn L. Martin Co. is using Masonite* Die Stock in 85% of the necessary dies, jigs and assembly fixtures.

That's a figure we're proud of, naturally. It means that this outstanding aircraft manufacturer appreciates the unique features of this dependable material.

For one thing, Masonite Die Stock will save you money. Its original cost is low. And, since it can be swiftly and accurately machined with high-speed equipment, production costs are trimmed. Hurry-up orders are turned out in jig time.

Masonite Die Stock is strong. It has exceptional flexural and compressive strength. It's light in weight, too—only one-sixth as heavy as commonly-used metals. Women can lift and carry without undue strain.

Wherever thin-gauge metals are cut, drilled, shaped, blanked, formed or stretched—that's where Masonite Die Stock can do a job for you. It's available in thicknesses of ¼ to 2 inches (easily laminated to greater thicknesses) and comes in sheets 48 x 72 and 48 x 144 inches. For more information about this amazing semi-plastic, fill out the coupon and mail today.

PRODUCTION PIN-UPS. Look for the next issue of "Production Pin-Ups" on your plant's bulletin board. Study the pictures and explanations of the latest uses of Masonite Die Stock.

*"Masonite" is a trade-mark registered in U. S. Pat. Off., and signifies that the Masonite Corporation is the source of the product.

Masonite BRAND DIE STOCK

Product of the State of Mississippi

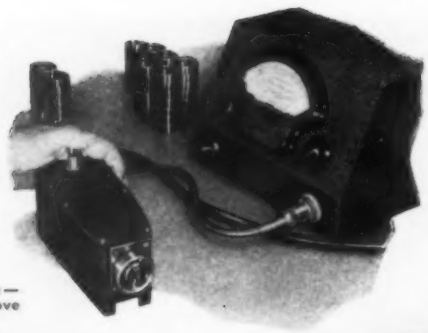
MASONITE CORPORATION, Dept. AM-11, 111 W. Washington St., Chicago 2, Illinois

Please send me illustrative literature and complete information about Masonite Die Stock.

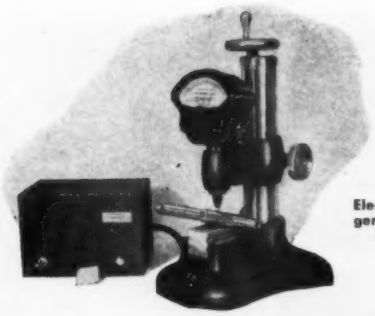
Name and firm _____

Address _____

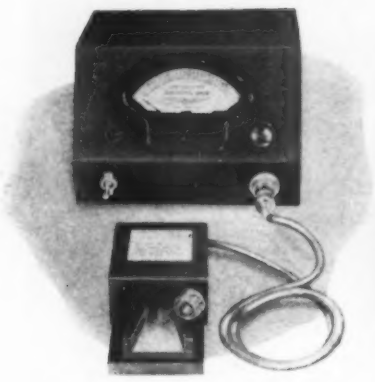
City _____ *State* _____



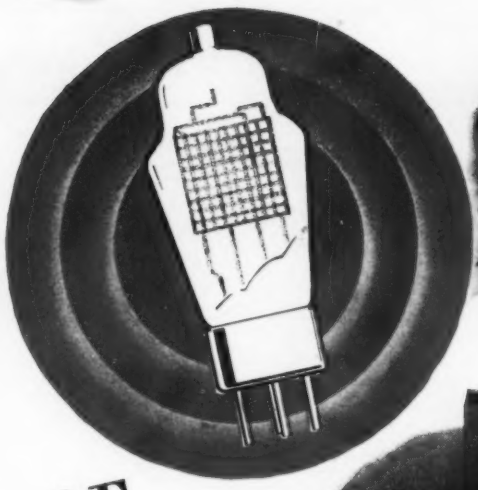
Bearing Race Gauge—measures outer groove to 5/100,000".



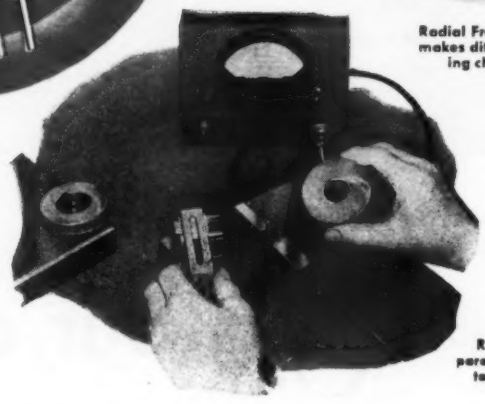
Electronic Comparator—general purpose; checks against Jo-Blocks.



Inner Race Gauge—checks bearing seat to 5/100,000".



Radial Freedom Gauge—makes difficult inter bearing check quickly.



Ring Gauge Comparator—checks gauges to 25/1,000,000".

MIRACLES OF MEASUREMENT

from the magic tube of electronics

TODAY, fine manufacturing calls for working tolerances not of thousandths—but ten thousandths, hundred thousandths and even millionths of an inch! One of the secrets of Jack & Heintz low cost mass production of high precision equipment lies in the ingenious electronic measuring gauges used throughout the eight plants.

With one of these J&H-developed-and-built gauges, even an inexperienced worker can make a complicated precision measurement in a second. For laboratory experiments, Jack & Heintz engineers have made an electronic gauge capable of measuring 2/1,000,000"! One of the shop gauges pictured is calibrated to 25/1,000,000; others in common use are measuring ten thousandths and hundred thousandths day in and day out.

While most of these gauges fall into the "special purpose" classification, they do have one thing in common. That is the basic electronic circuit system that makes them so highly accurate. This method of measurement is new and, as perfected by J&H engineers, has unlimited possibilities for use wherever exceptionally precise checking of parts must be done quickly.

Jack & Heintz has made effective use of these electronic devices to speed war production. They can be adapted to postwar production, too. Merely by changing the holding fixture on each gauge, the magic tube of electronics can be converted to speeding finer things for better, lower cost peacetime products.

If you have a measuring, checking, testing or production problem that calls for forward-seeing engineering such as this, get in touch with Jack & Heintz today!

Jack & Heintz, Inc., Cleveland, Ohio, manufacturers of Aircraft Engine Starters, Generators, Gyro Pilots, Gyro Flight Instruments, Magnetos, Motors.

JACK & HEINTZ
Incorporated

Buy More War Bonds and Stamps

NICKEL
gives a bandsaw BITE!

...this specialty steel
(a high-carbon grade)
toughened by Nickel

Built for tough jobs, this bandsaw is .80 carbon steel fortified with 2.25 to 2.50% Nickel.

The maker ... E. C. Atkins and Company of Indianapolis, Indiana ... specifies Nickel to secure the reliable performance assured by the special mechanical properties developed by high-carbon Nickel alloy steel.

In addition to imparting ability to withstand repeated flexure, Nickel improves wear resistance, handling characteristics in fabrication and response to heat treatment.

Consult us on its use in your products or equipment. Write us today.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.

We Shall Not Fail Them

THERE will be jobs a-plenty *with alert manufacturers* who are alive to the almost universal range of advantages provided by OH-38 for new products—for the betterment of present products at lower cost.

Whether your plans are for heavy capital goods, or simplest household utilities, OH-38 can be most profitably figured in.

OH-38 is easily machinable—easy on tools—holds threads without stripping — non-corrosive — non-oxidizing—non-magnetic—tensile strength 35,000 to 40,000 lbs. per sq. in.—polishes to mirror brilliancy—takes chrome, nickel, or tin plating—may be anodized. It has been a basic factor of production in hundreds of plants for five years. Exclusively used in castings by Hedstrom. *Send for literature.*

OH-38 is an important reason why you will be needed in peace as in war. New models. New products. Jobs!

Many component parts of post-war products can be made better, faster, cheaper—with

OH 38

Aluminum Alloy, Non-Heat-Treated—a perfected metal with proven superiority in a wide range of machining operations—an exclusive product of

Oscar W. Hedstrom Corporation

4812 W. Division St., Chicago 51, Illinois

Manufacturers of Aluminum, Brass, Bronze, and High Conductivity Copper Castings. Pattern Makers. Complete Mechanical Assemblies and Models to Specifications.

The simpler... ...the Better!

GUSHER

COOLANT PUMPS

Model 11020-A

Simple in design, sturdy in construction, Ruthman Gusher Pumps are trouble free, long lived, and efficient in operation.

There are fewer parts to wear, resulting in less friction, minimum maintenance costs, constant dependable operation.

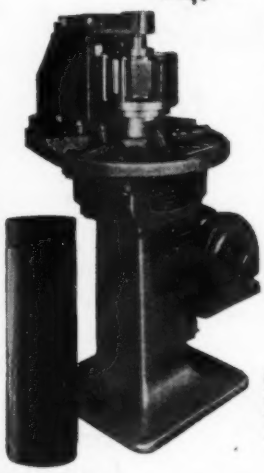
So specify Ruthman Gusher Pumps on your machines. There's a model for every requirement.

Write for our new condensed catalog.

THE RUTHMAN MACHINERY CO.
1809 READING ROAD
CINCINNATI 2, OHIO
The "GUSHER"—A Modern Pump For Modern Machine Tools

Knurls and Marks

IN ONE OPERATION



The simultaneous performance of two or more operations such as combining knurling and marking is only one way in which Noblewest marking equipment speeds production, cuts costs. Noblewest equipment is saving time and money every day in marking hundreds of different products with precision and speed that only long experience and careful engineering could produce. Model 73 (illustrated) is tooled for marking and knurling vulcanized fibre handles. Write today for full information.

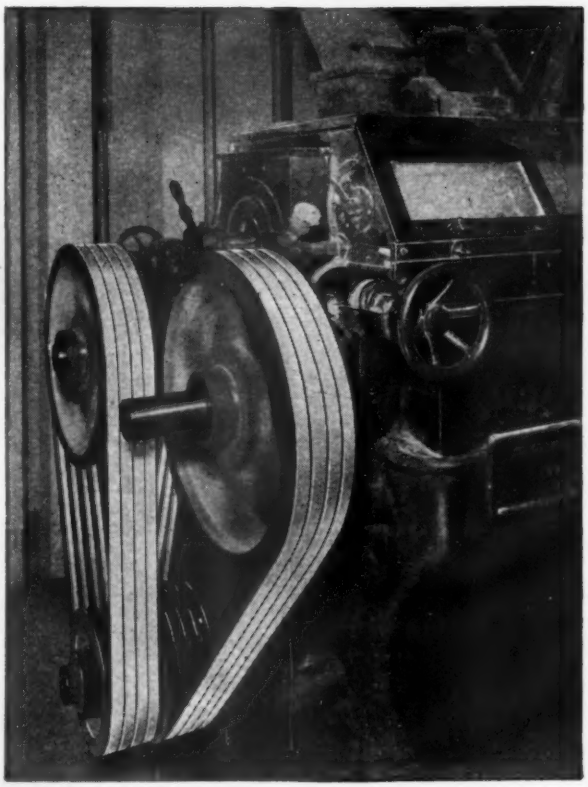
NOBLE & WESTBROOK MANUFACTURING CO.
Marking Specialists Since 1904
EAST HARTFORD, CONNECTICUT

MARK IT BEST WITH NOBLEWEST

NOBLEWEST IMPROVED MARKING DEVICES

The reason for this fact is worth knowing

Your **STANDARD** GATES VULCO ROPES are TODAY out-performing **ANY** V-Belts **EVER** Built Before!



All Gates V-Belts are Built with *The Patented* CONCAVE SIDE

During the war, our Army tanks, tractors and self-propelled big guns required, for *combat* service, V-belts built to performance standards never dreamed of before. Gates developed these greatly superior V-belts through intensified, specialized research — and here is what this NOW means to you:—

Here is the reason

● **Every improvement developed by Gates for these Army V-belts has also been added, day by day, to the quality of the standard Gates Vulco Ropes which have been delivered to you.**

Here is one rare instance in which you have received *immediately* the full advantage of war-time improvements developed primarily for military use. Ordinarily, *you* have to wait. But in the case of Gates V-belts, everyone recognized the vital role they played in maintaining the production that proved so essential in winning the war.

That is why Gates has been able to pass on to you, day by day, every V-belt improvement developed for our armed forces during the war — and that is why your *Standard* Gates Vulco Ropes are today outperforming *any* V-belts ever built before!

Gates

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THE GATES RUBBER COMPANY

Engineering Offices and Jobber Stocks in All Large Industrial Centers

4511

GATES VULCO ROPE DRIVES

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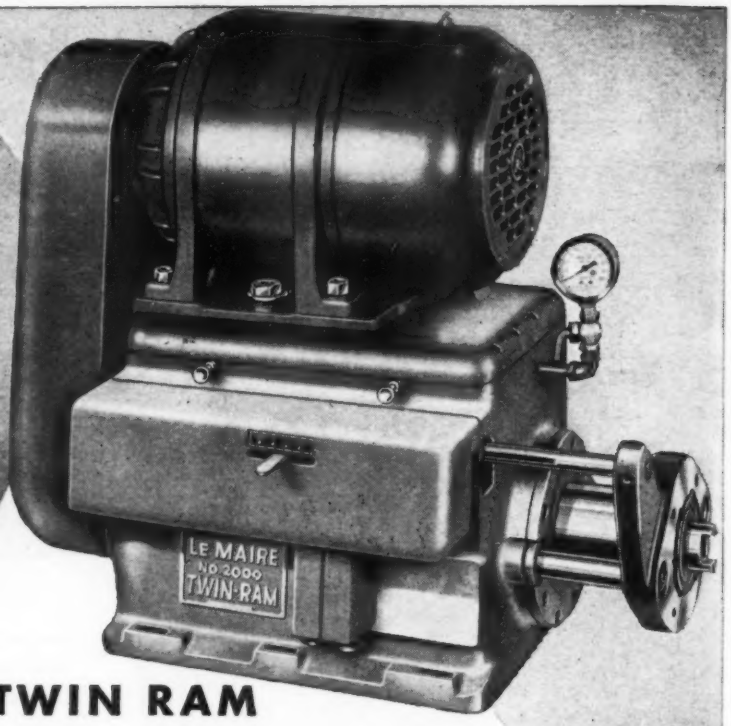
PORTLAND 9, ORE., 333 N.W. 5th Ave. DALLAS 2, TEXAS, 1710 N. Market St. SAN FRANCISCO 3, CAL., 170 Ninth St.

This HYDRAULIC POWER UNIT CAN WORK FOR YOU IN A MULTITUDE OF APPLICATIONS!



. . . it is the LeMaire TWIN RAM which can be utilized in making your own special purpose machines for drilling, boring, reaming, etc.

Being self-contained, the TWIN RAM lends itself to an exceptionally wide range of applications, and its usefulness is not restricted—this feature means extra value. It can be mounted horizontally, vertically or at any angle, and be transferred from one base to another as requirements dictate.

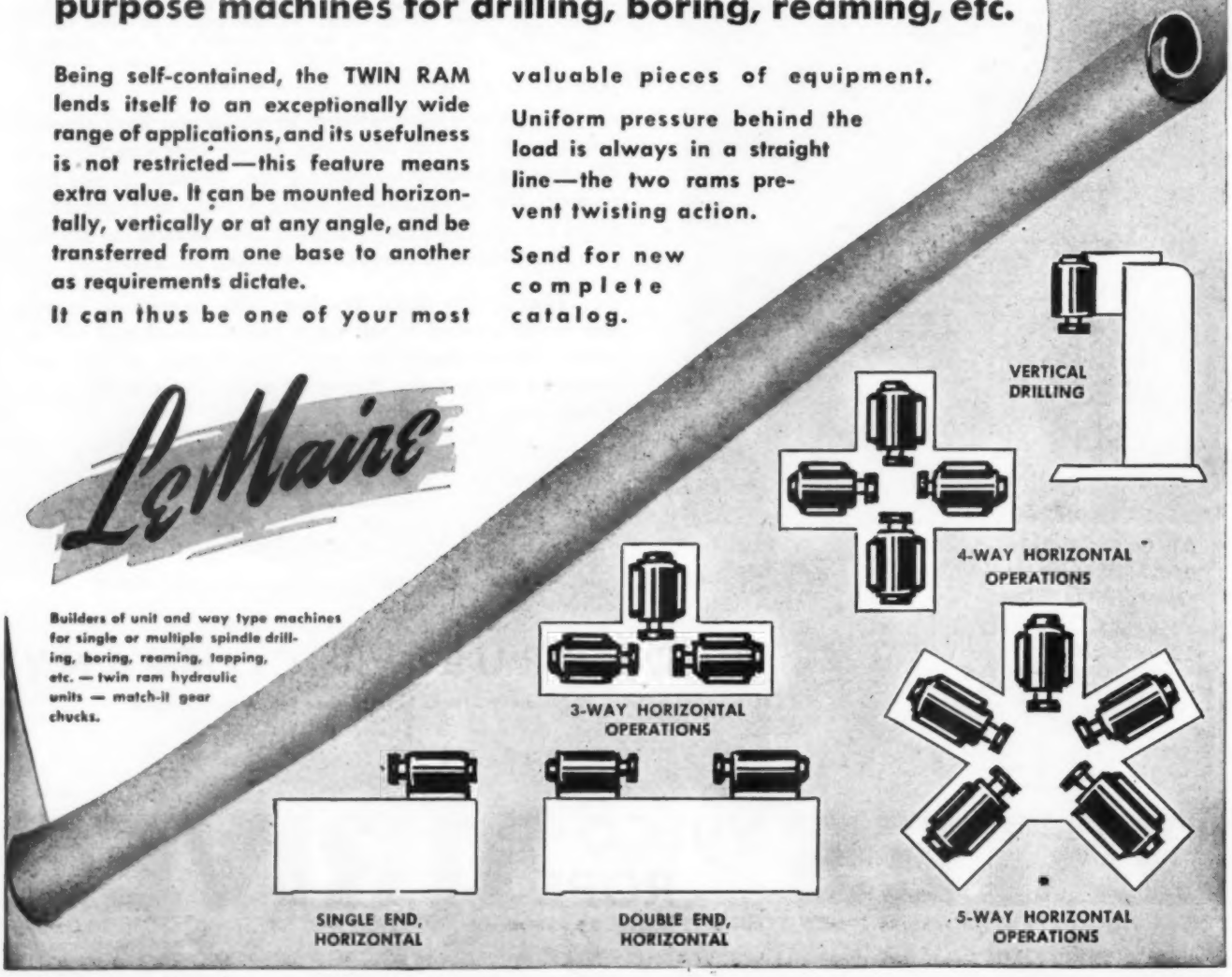
It can thus be one of your most valuable pieces of equipment.

Uniform pressure behind the load is always in a straight line—the two rams prevent twisting action.

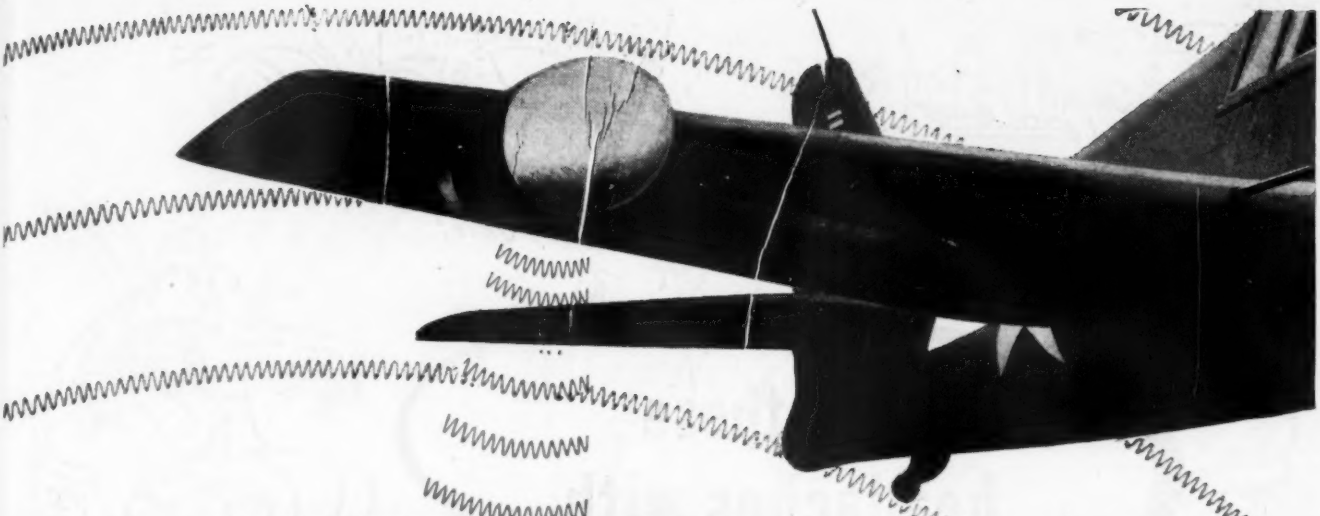
Send for new complete catalog.

LeMaire

Builders of unit and way type machines for single or multiple spindle drilling, boring, reaming, tapping, etc. — twin ram hydraulic units — match-it gear chucks.



LeMAIRE TOOL & MFG. CO., 2657 So. Telegraph Rd., Dearborn, Mich.



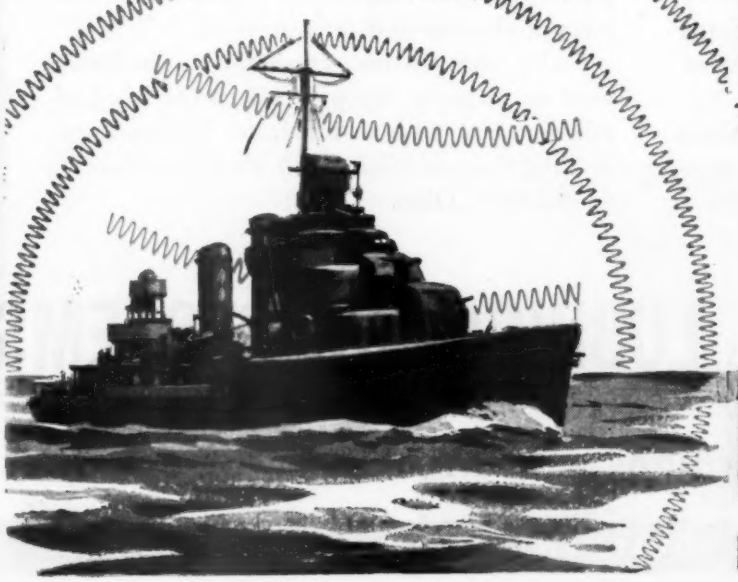
PRESENTING THE CASE FOR RADAR

AS THE STORY of radar unfolds, the nation becomes increasingly aware of the extreme importance of this one-time "secret weapon." And behind *that* story is another—about radically new types of housings that had to be developed before radar could perform its vital functions on land, at sea, and in the air . . . housings called radomes.* Certain types, such as the radome illustrated, were produced from woven glass cloth and BAKELITE laminating resins.

Manufacturers, designers, and engineers will be interested in the exceptionally exacting requirements that were met: low power factor and low dielectric constant at high radio frequencies; high tensile, flexural, and compressive strengths; and extreme weatherability. Still other advantages of this new and superior electrical insulating plastic included good color stability and resistance to marine growths. Productionwise, these laminated radomes were formed at low fabricating pressures, in comparatively inexpensive molds. They demonstrate the practicality and economy of forming large, intricate shapes by this laminating-molding technique at pressures frequently as low as one pound per square inch.

Write Department 59 for further information on BAKELITE resins for high-, low-, and contact-pressure laminating, and the names of the suppliers of the finished laminates.

*Radome illustrated through courtesy of Andover-Kent Aviation Corp.



TRADE (B) MARK

BAKELITE CORPORATION

Unit of

Union Carbide and Carbon Corporation

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30 EAST 42ND STREET, NEW YORK 17, N.Y.

BAKELITE

TRADE-MARK

LAMINATING PLASTICS

Avoid these headaches with a *Trabon* LUBRICATING SYSTEM

● Eliminate the costly downtime while a man crawls around lubricating each bearing individually,—the breakdown, costly repairs, and lost production if he misses one, with a Trabon Lubricating System.

Trabon Systems make certain that every bearing, whether large or small, easy or difficult to reach, receives just the desired amount of lubricant, at just the desired frequency,—while the machine is in operation. Trabon Systems prolong bearing life, minimize accidents and compensation costs, assure users a maximum of long, efficient trouble-free service.

Let Trabon engineers with their long and successful experience in this work, show you how a Trabon Lubricating System, individually engineered to the requirements of your own particular and individual job, will increase your production and cut your costs.

Fully descriptive engineering bulletin sent on request. Simply tell us the kind of machine you wish to lubricate. Trabon Engineering Corporation, 1819 East 40th Street, Cleveland 3, Ohio.

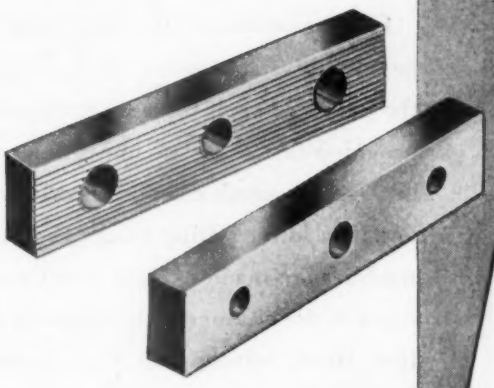
Trabon LUBRICATING SYSTEMS

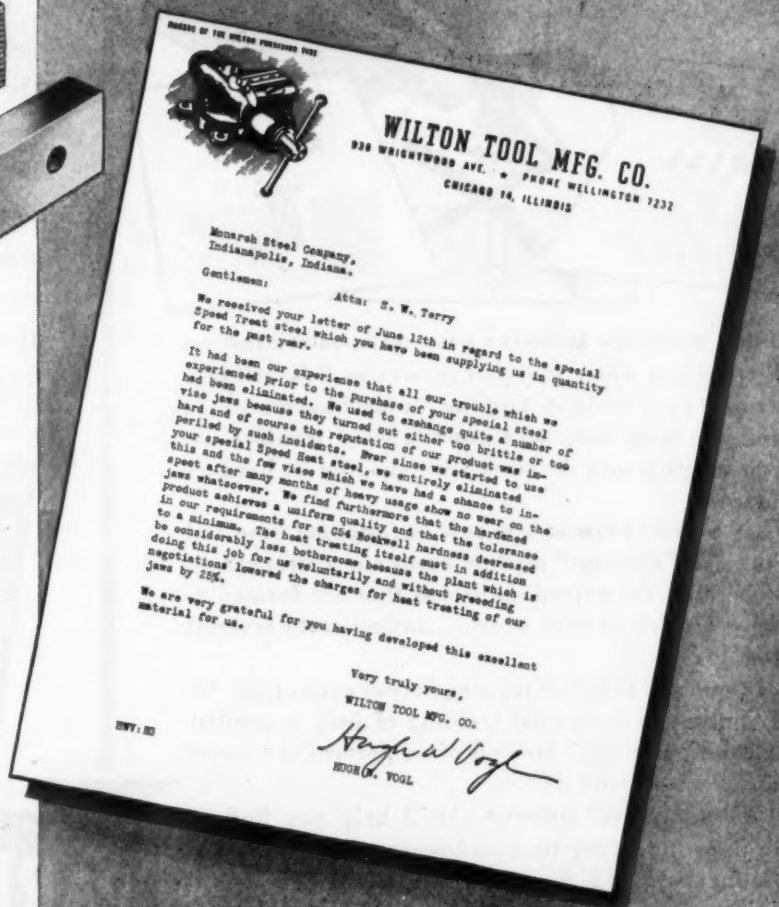
. . . for Machines and Machinery of all kinds

INDUSTRIAL LUBRICATING EQUIPMENT EXCLUSIVELY SINCE 1922

Eliminate Your Troubles Too!

Wilton Tool Mfg. Co. of Chicago, Illinois, reports ALL previous trouble in making Vise Jaws eliminated by use of Speed Treat Steel.





WILTON TOOL MFG. CO.
938 WRIGHTWOOD AVE. ✦ PHONE WELLINGTON 7232
CHICAGO 14, ILLINOIS

Monarch Steel Company,
Indianapolis, Indiana.

Gentlemen:

Attn: S. W. Terry

We received your letter of June 12th in regard to the special Speed Treat steel which you have been supplying us in quantity for the past year.

It had been our experience that all our trouble which we experienced prior to the purchase of your special steel had been eliminated. We used to exchange quite a number of vise jaws because they turned out either too brittle or too hard and of course the reputation of our product was imperiled by such incidents. Ever since we started to use your special Speed Heat steel, we entirely eliminated this and the few vises which we have had a chance to inspect after many months of heavy usage show no wear on the jaws whatsoever. We find furthermore that the tolerance product achieves a uniform quality and that the hardened in our requirements for a C54 Rockwell hardness decreased to a minimum. The heat treating itself must in addition be considerably less bothersome because the plant which is doing this job for us voluntarily and without preceding negotiations lowered the charges for heat treating of our jaws by 25%.

We are very grateful for you having developed this excellent material for us.

Very truly yours,
WILTON TOOL MFG. CO.
HWV:HD
HUGH W. VOGL

The Vise Jaws and the Facts!

Previous jaws were too hard or brittle, causing serious complaints from their customers. Jaws made from Speed Treat X1545 Steel completely eliminated this and show no wear after months of use.

Heat treating cost immediately dropped 25%—a major production cost saving.

Write for SPEED CASE and SPEED TREAT CATALOG
Our Metallurgists are at your service

Licensee for Eastern States
THE FITZSIMONS COMPANY
YOUNGSTOWN OHIO

Licensor
MONARCH STEEL COMPANY
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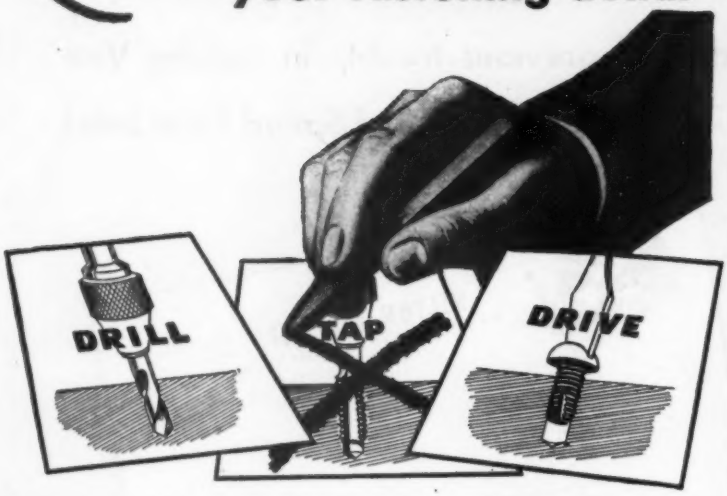
TAKE THIS

Short Cut to Better Assemblies

...and save up to 50¢ on your fastening dollar



A FASTENING OPERATION BECOMES SIMPLY "DRILL-DRIVE", instead of drill-tap-drive, when you change over to P-K Self-tapping Screws. You eliminate tapping for machine screws . . . end fumbling with bolts and nuts . . . avoid troublesome inserts in plastics, and do away with riveting in hard-to-reach places.

BESIDES SAVING YOU FROM 30% to 50% in fastening time and labor, the P-K "shortcut" method turns out a stronger assembly, because the extruded threads that are formed as P-K Screws are driven hold securely, and resist the severest vibration.

YOU CAN CHANGE to P-K Self-tapping Screws over night. No special equipment or special training of help is needed, although the "short cut" method often permits the use of power, in place of hand drivers.

CALL IN A P-K ASSEMBLY ENGINEER. He'll help you find all opportunities for saving time and money, and improving your product, with P-K Screws. Or, mail assembly details direct for recommendations. Parker-Kalon Corporation, 208 Varick Street, New York 14, N. Y.

SOLD ONLY THROUGH ACCREDITED DISTRIBUTORS

P-K "SHORT CUT" METHOD ADDS STRENGTH, PERMITS LOWER PRICE FOR PROJECTOR

In the assembly of this home movie projector, Universal Camera Corp. found that the use of P-K Self-tapping Screws not only provided fastenings of improved security, but saved enough assembly work hours to permit a lower selling price. Eight sub-assemblies are made of light metal parts fastened to die castings with the use of 23 P-K Hex Head Self-tapping Cap Screws and Type "U" Hardened Metallic Drive Screws.

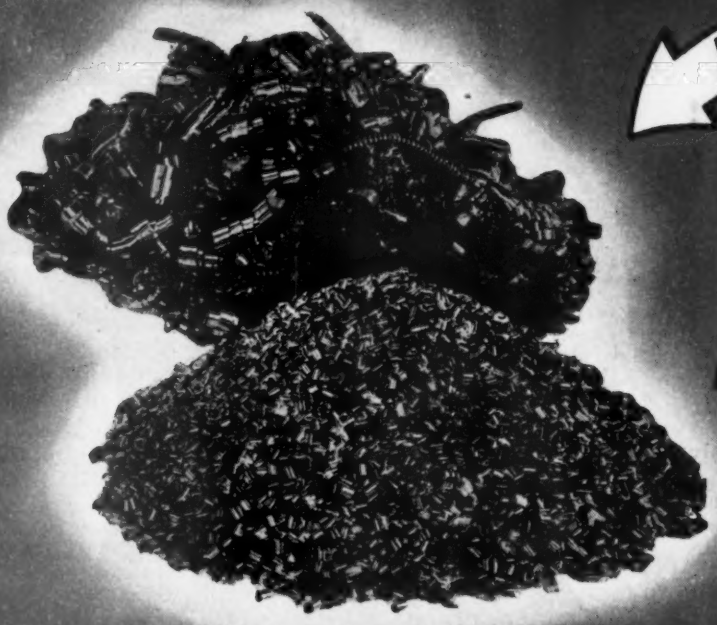
"HOW TO USE" BOOKLET – FREE on request – will give you quick facts on all the P-K Self-tapping Screws and other Fastening Devices . . . tell you where and how to use them. Write for a copy . . . ask for Form 480.

PARKER-KALON
Quality-Controlled
SELF-TAPPING SCREWS

For Every Metal and Plastic Assembly

How Up-To-Date are you on Aluminum?

SEE THE DIFFERENCE!



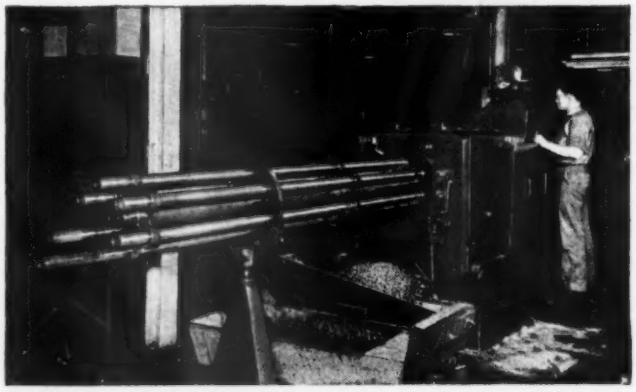
A

TIME LOST! Ordinary aluminum machining stocks produce long, spiral chips which curl around tool and machine, fouling moving parts and clogging feeder lines. A waste of operating and clean-up time. Alternative: use R317.

B

TIME SAVED! R317, Reynolds free machining strong aluminum alloy, breaks into small chips when machined. These particles fall clear, do not interfere with operation of tool or machine, are easily disposed of.

How Free-Machining R317 Cuts Machining Costs



Test R317 in your own shop. Nationwide reports demonstrate that it is admirably suited in "T" temper to general manufacture of aluminum alloy screw machine products requiring free-machining characteristics. Available in rounds, hexagons, rectangles and squares.

Metallurgically speaking: R317 is an aluminum-copper-manganese-magnesium alloy (17S) with small additions of other metals to improve machining characteristics without sacrifice of strength.

Economically speaking: Since cold drawing is not required to impart hardness and strength after heat treatment, tendency to warp during machining is minimized; also greater uniformity is gained. Result: time saved all along the line! Fewer rejects! Finer production *faster!*

Consider Aluminum . . . strong . . . light weight . . . corrosion-resistant . . . readily workable. Whatever your problem, Reynolds technicians will gladly work with your engineers. Offices in principal cities. Phone nearest office . . . or write Reynolds Metals Company, Aluminum Division, 2523 South Third St., Louisville 1, Kentucky. **Consult Reynolds.**

Write for Bulletin 55-A on R317 . . . also Bulletin 100-A. "Reynolds Aluminum. Its Important Role in Tomorrow's Products."

Buy VICTORY Bonds Now . . . and HOLD Them!

REYNOLDS METALS

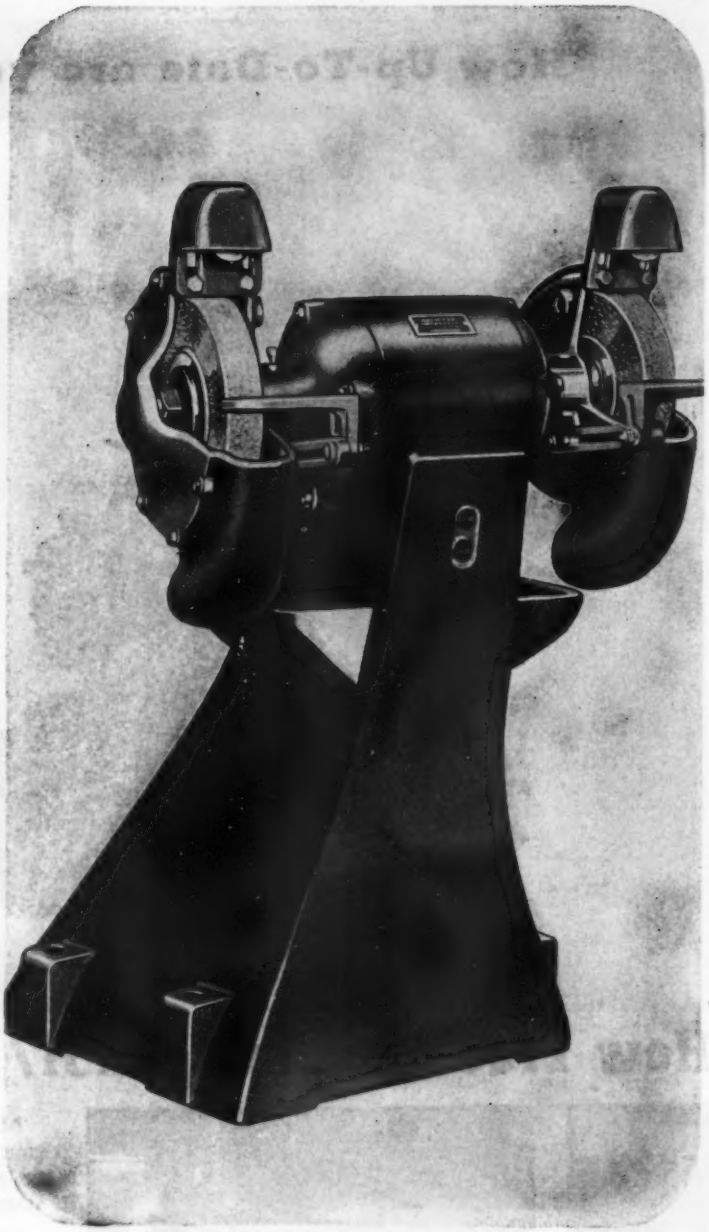
REYNOLDS ALUMINUM

The Great New Source of

INGOT · SHEET · SHAPES · WIRE · ROD · BAR · TUBING · PARTS · FORGINGS · CASTINGS · FOIL · POWDER

3173-A1-45

● *Built by* THE BROWN-BROCKMEYER CO.

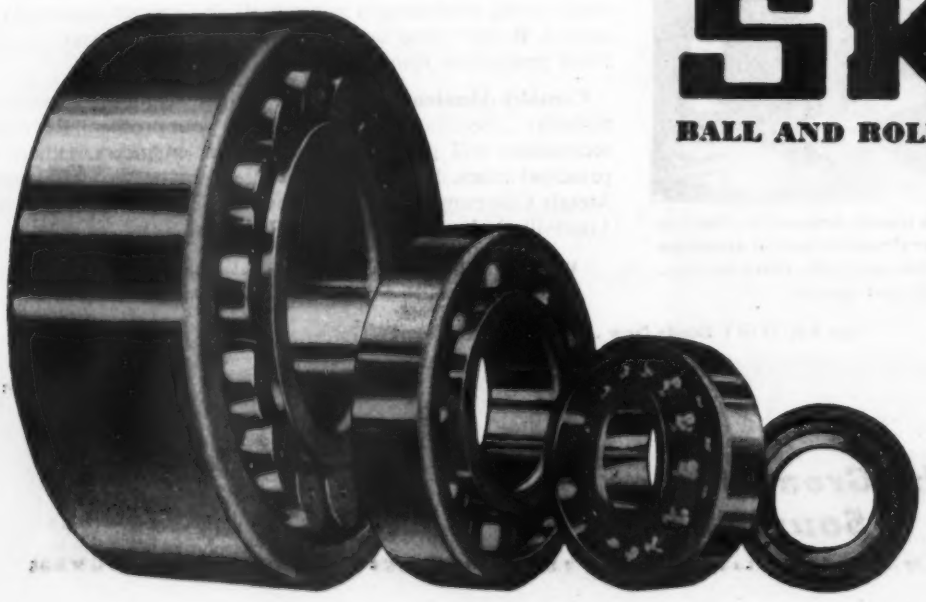


Eliminate

SPINDLE VIBRATION!

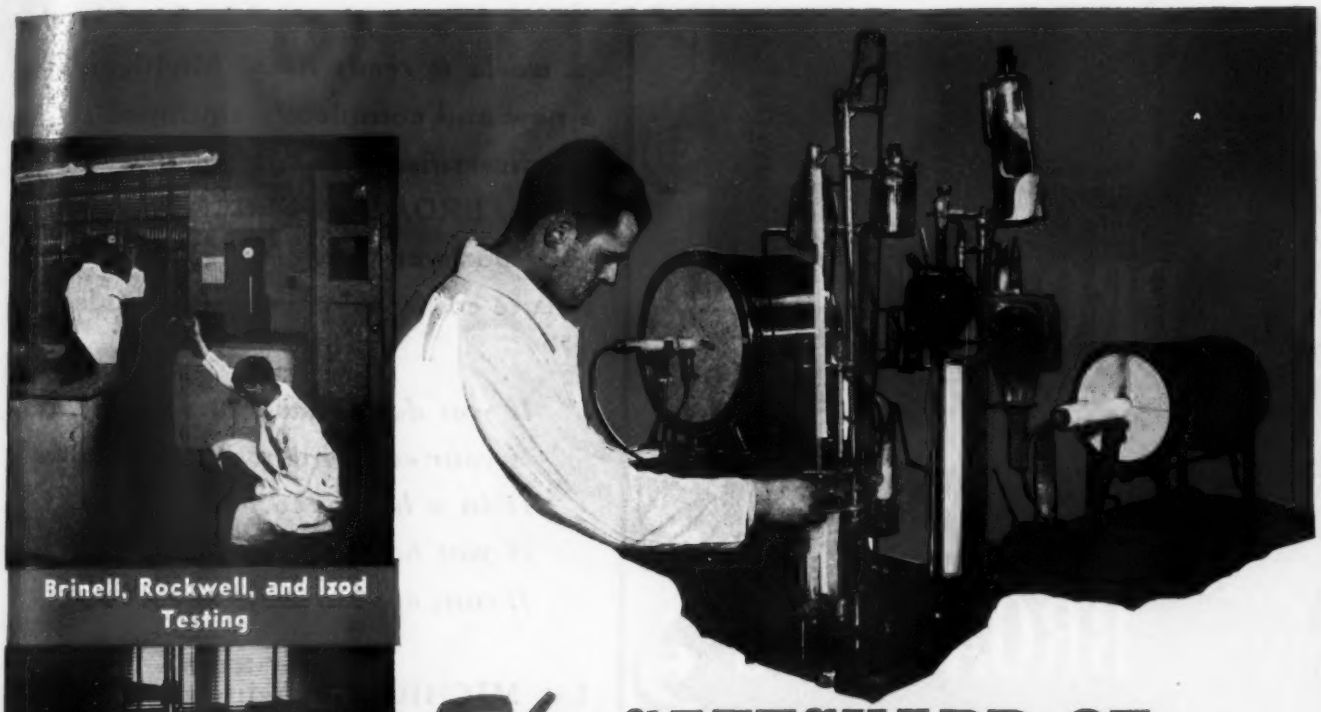
Friction serves a useful purpose on the wheels of this Ball Bearing "Motor-in-Head" Heavy Duty Pedestal Type Grinder. But it's not permitted on the spindle where two SKF Ball Bearings are located near the wheels to eliminate bearing wear and vibration. Easily taking radial and thrust loads, SKF Bearings never require adjustments . . . need lubrication only infrequently . . . keep their accuracy through a ripe, old age. Submit *your* designs for the approval of our engineers . . . TODAY. 5873

SKF INDUSTRIES, INC., PHILA. 34, PA.



SKF

BALL AND ROLLER BEARINGS



Brinell, Rockwell, and Izod Testing

Hydraulic tensile strength testing

Metallographic inspection

Experimental laboratory heat treating

The SAFEGUARD OF LABORATORY CONTROL

A modern operating laboratory exercises close control over all processes in the production of forgings which bear the Kropp trade mark. This facility is complete and equipped for making physical, chemical and metallurgical determinations of all kinds. Here, accurate analysis is made of pilot lots of thousands of tons of steel yearly. Acid etching, and heat treating facilities, Rockwell and Brinell hardness testers, hydraulic tension testing machines, impact testing machines, Magnaflux inspection, temperature measuring and control equipment, a chemical laboratory and a myriad of auxiliary equipment to assure quality and uniformity are available.

At Kropp Forge, test and inspection begin when the steel arrives from the mill. Inspection of forgings during processing includes laboratory study of problems dealing with dimensions, grain flow, heat treatment, and the elimination of defects. A number of vital determinations are made by the laboratory on test pieces before forgings are released by final inspection. Thus are the quality and uniformity in Kropp Forgings assured.

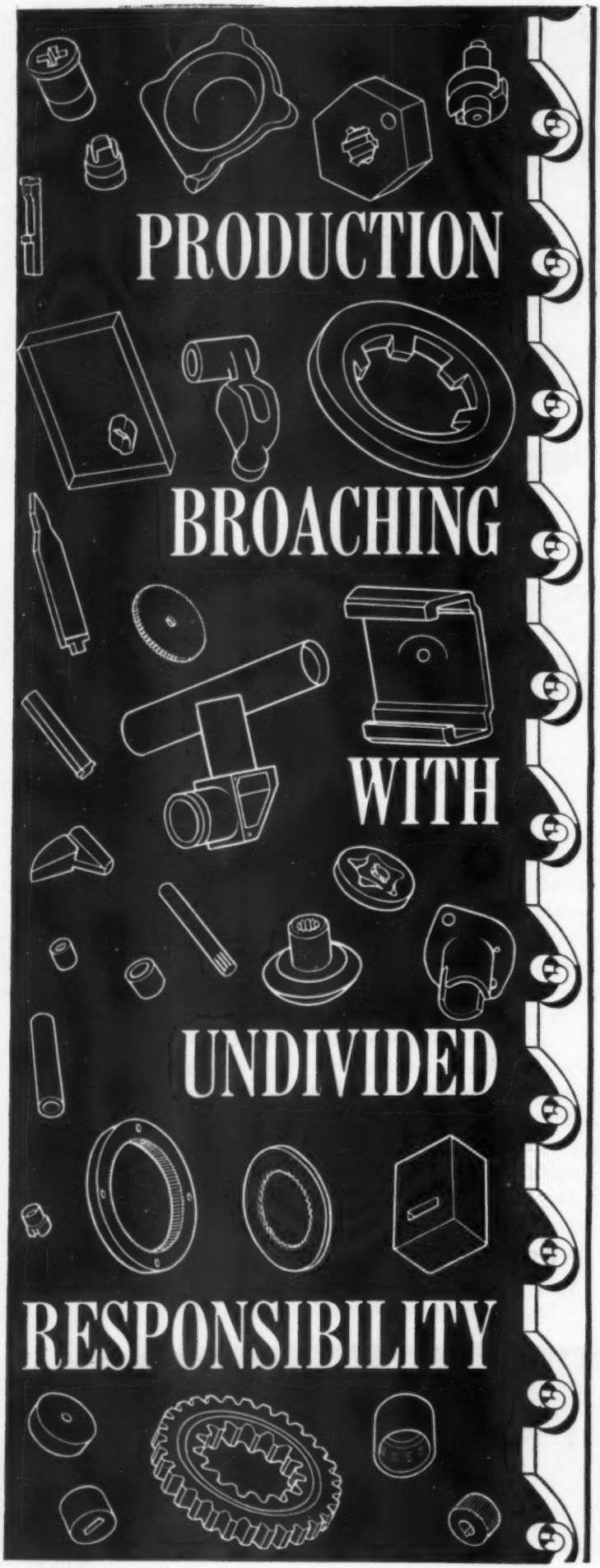
For flat die, drop or upset forgings, call your nearest Kropp engineering representative or write direct for immediate quotation.

KROPP FORGE COMPANY
5301 W. Roosevelt Road, Chicago 50, Ill.
Engineering Representatives In Principal Cities

SERVING INDUSTRY SINCE 31
KROPP FORGE CO
OVER 100 YEARS

KROPP

ARMY ★★ E ★★ NAVY



THE largest plant of its kind in the world is ready now. **Michigan has a new and completely equipped plant for *diversified commercial Broaching.* When BROACHING is indicated in your postwar "Processing" don't substitute costly machining methods.**

If you don't have equipment.
If your equipment is filled up.
If in a hurry to get started.
If you have complicated jobs.
If runs are too short to tool up.

Let MICHIGAN engineer the job — design and build the tools — broach the part — and do it all with UNDIVIDED RESPONSIBILITY.

WE DESIGN — BUILD — RECONDITION AND USE BROACHES

We design and build every type and size of broaches—broaching fixtures—involute gages (plug and ring) arbors —holders and pullers for broaching.

Michigan specializes in broach reconditioning and resharpening

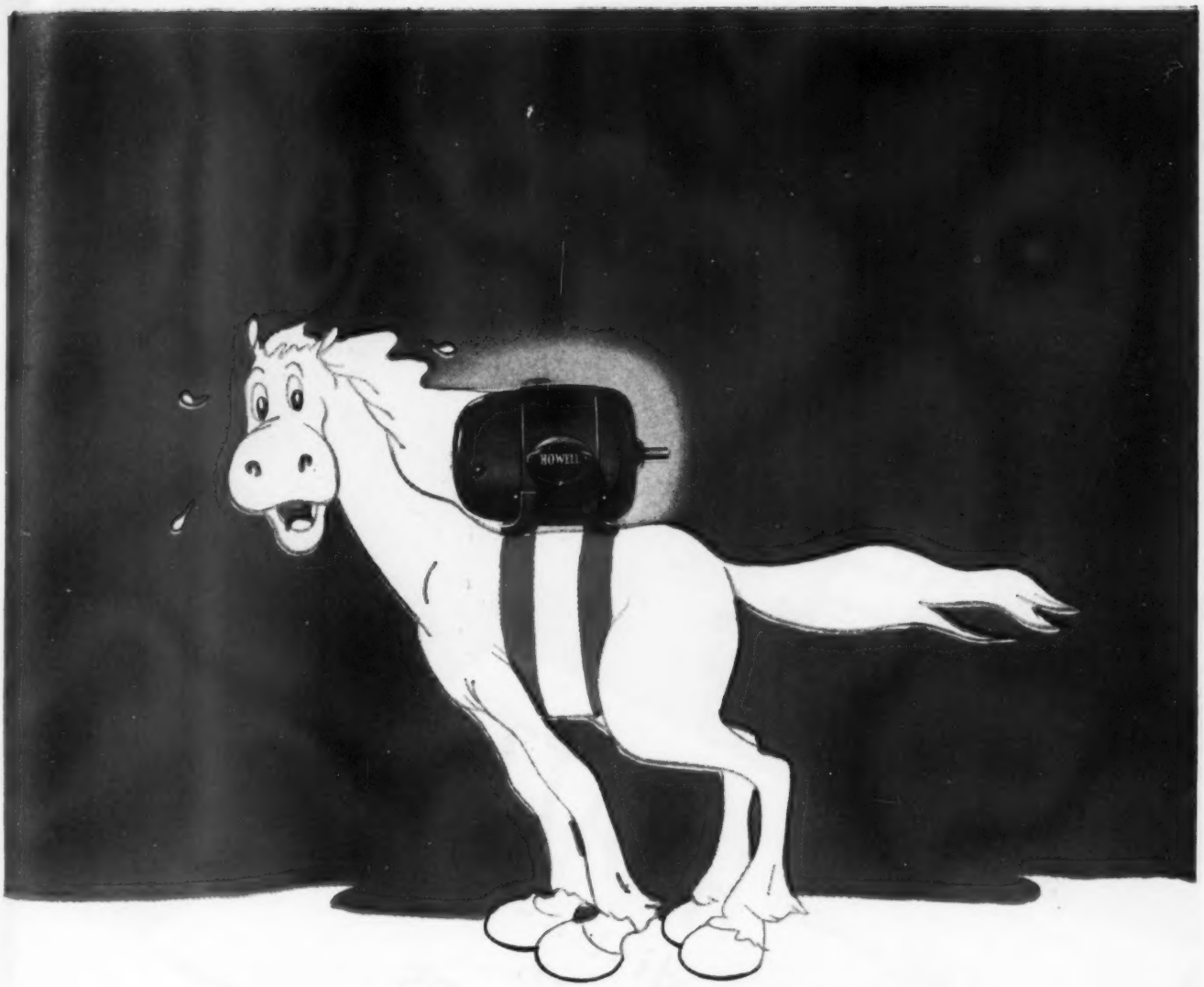
M B C
BROACHING SIMPLIFIED

Production Broaching Division

MICHIGAN BROACH COMPANY

10371 NORTHLAWN AVENUE
DETROIT 4, MICHIGAN

For complete information on Production Broaching, send your parts prints and production requirements to Department N, Michigan Broach Company.



HERE'S WHY I'M RED BANDED!

The Howell Protected Type Motor, shown, gives complete protection against dripping liquids, metal chips and other falling particles. Completely streamlined—utilizing non-breakable steel frame—malleable or steel base—cast iron end plates and cast iron weatherproof terminal box are standard construction features. Special horizontal and vertical mountings are available. *Available in sizes 5 H.P. and smaller. Other sizes and types available up to 150 H.P.*

Years ago—1915 to be exact—we set out to build a line of motors to do specific jobs in industry.

These jobs were all what you would call "tough jobs." They were gruelling tasks which required the precision-building of higher-quality motors. They were jobs which demanded thorough insulation and sturdy construction.

We built our motors to meet the rigid requirements of just such jobs as these. To distinguish them from other makes, we put Red Bands on them. We constantly challenged buyers to give "Red Band" Motors their tough jobs.

They did! Performance alone brought bigger and bigger sales volume. Each year, more and more industries, like yours, learned to depend on Howell quality.

Today, modern construction of our motors does not make it practical to include the Red Bands, but their quality is the same or better than that of the motors that bore the famous Red Band.

To remind you that we are continuing our high quality construction and that we are zealously guarding our reputation we have put the Red Bands on the friendly Howell Horse.

HOWELL ELECTRIC MOTORS COMPANY
HOWELL, MICHIGAN
Manufacturers of Quality Motors Since 1915

...BEARINGS: HYATT supply 6 distinct advantages to HELIQUAD PUMPS

MORE THAN 20 YEARS AGO Hyatt Roller Bearings were first used in Kinney Manufacturing Company's Heliquad Gear Pump. These bearings provided six distinct advantages which have greatly helped to make this pump famous for performance:

1. **Almost total elimination of wear at bearing positions.**
2. **Packings stay concentric, wear evenly, require infrequent adjustment or renewal.**
3. **Main gears maintain correct operating relationship, last longer.**
4. **Timing gears continue to roll on their pitch lines, do not wear.**
5. **Simple external bearing mounting design is possible (due to Hyatts requiring little lubrication).**
6. **Pump starts easily, runs freely.**

Hyatt engineers will gladly consult with you on any present or future bearing problem you may have.

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION
Harrison, New Jersey • Chicago • Detroit • Pittsburgh • Oakland, California

You can rely on the "Unbrako" Knurl Pointed Socket Set Screw (above), because it "stays put" and resists all attempts of vibration to shake it loose! It's the knurled cup point that assured this firm grip . . . the knurls dig-in and *hold* Despite this tenacity against vibration, however, these screws can easily be backed out with a wrench and used again and again.

Knurling of the head of the "Unbrako" Socket Cap Screw (left) provides a firm grip, even for oily fingers. Speeds production—saves time, for the "Unbrako" can be screwed-in farther and faster by hand before a wrench is needed.

Both screws are available in sizes from #0 to 1½" in diameter —full range of lengths. For more information, write for our "Unbrako" Catalog.

UNBRAKO

Reg. U. S. Pat. Off.

Knurling of Socket Screws originated with "Unbrako" years ago.

OVER 40 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX 4, BRANCHES: BOSTON • CHICAGO • DETROIT • INDIANAPOLIS • ST. LOUIS • SAN FRANCISCO

SPECIAL COLD FORGED PARTS • STANDARD CAP SCREWS • HARDENED AND PRECISION GROUND PARTS • SHEET METAL DIES FROM THE LARGEST TO THE SMALLEST • JIGS • FIXTURES • STEAM-HEATED PLASTIC MOLDS • SPECIAL PRODUCTION TOOLS • R-B INTERCHANGEABLE PUNCHES AND DIES • DIE MAKERS' SUPPLIES

PRECISION • EXPERIENCE • ALLIED CORPORATION PRODUCTS • DEPENDABILITY

COLD FORGED PARTS

Allied is ready to make cold forged parts *fast* . . . and by the million to your exact specifications for trucks, tractors, automobiles, home appliances, rolling stock and other machines. Each forging Allied makes of any type is exactly alike to the finest tolerances. Cold forged in one piece from coiled steel wire or bars, each embodies the strength, precise dimensions and flexibility of design that have made dependable quality synonymous with the Allied name. Find out now just how much the precision workmanship of Allied's four superbly-equipped plants can contribute to your production problems. Send in your blueprints—or consult Allied engineers. They are always at your service.

ALLIED PRODUCTS CORPORATION

Department 33
4612 Lawton Avenue
Detroit 8, Michigan

O. K. for a Handyman

Fine for a Painter

Swell for a Knife Sharpner

but—

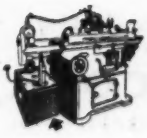
for applying coolants to machine tools

it's

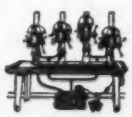
GRAY-MILLS COOLANT SYSTEMS

DON'T slow down good machines and good workmen with makeshift coolant applications. With a Gray-Mills Coolant System you can simply, inexpensively apply coolants and cutting oils to all machining operations. The system can be switched from one machine to another, will apply coolants and cutting oils in controlled volume. constantly or intermittently,

A Gray-Mills Pumping Unit on machines not having a built-in-system, results in stepped-up production because it is possible to increase cutting speeds, prolong tool life and improve finish.



Lower production costs—get the most out of your machines—grinders, drill presses, abrasive cut-off machines, lathes, metal cutting band saws, milling machines, etc.—with a Gray-Mills Coolant System. They are available in a variety of models, with pans and fittings for every requirement. Send for complete information today.



GRAY-MILLS CO.

1953 Ridge Avenue, Evanston, Illinois

GRAY-MILLS

Complete Portable

COOLANT SYSTEMS

FRACTIONAL H. P. PUMPS • PARTS CLEANING SYSTEMS
INDUSTRIAL FLUID REFRIGERATING SYSTEMS

GRAY-MILLS

SUPERFLO

Centrifugal Pumps for coolants—cutting fluids lubricants

• The advanced design and built-in efficiency of Superflo Pumps gives them increased capacity to the point where, a 1/8 H.P. model is comparable in volume delivered to many 1/4 H.P. pumps.

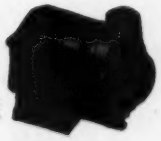
Superflo's integral-streamline design gives compactness, strength and ease of installation. Dependable—service-free in performance, they are ideal for pumping coolants, cutting oils and lubricants, and are easily adapted to any machine. The flow can be regulated from a drip to a full stream without overloading the motor. Capacities from 9 to 44 gallons per minute. Models available for fluids with high abrasive content. There's a Superflo Pump for "superformance" on almost every application... for replacement or as original equipment. Write and tell us your needs.

MODELS FOR EVERY NEED

For submerging in tank, or mounting integrally with cover.

For submerging in tank and mounting to cover.

For submerging in coolant reservoir



For horizontal-external mounting

For vertical-external mounting with inlet through mounting brackets.

GRAY-MILLS CO.

1953 Ridge Ave., Evanston, Ill.

Check the "FLOATING PISTON" in GEROTOR 4-WAY HYDRAULIC VALVES

● "FLOATING PISTON" design provides tight sealing ability with extreme ease of operation. This construction gives the piston a close precision fit in the valve bore and still allows it to move freely and easily, because such movement is independent of the valve stem in the valve covers.

Other features are:

● "O" ring seal design prevents oil from leaking past piston stem and reduces friction.

● "O" ring seal on valve covers assures positive sealing with no gasket.

● Large oil passages allow full capacity flow.

Send for Catalog showing complete line of Gerotor Hydraulic Valves, Cylinders, Pumps and Pump Units.

GEROTOR MAY CORP., LOGANSPORT, IND.

PLANTS AT BALTIMORE, MD., LOGANSPORT, IND.

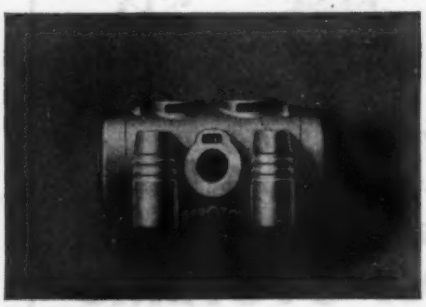
4 TYPES OF ACTION
Standard, Spring Return, Spring Centered, Ball Detent.

5 PISTON DESIGNS
To meet the requirements of any hydraulic circuit.

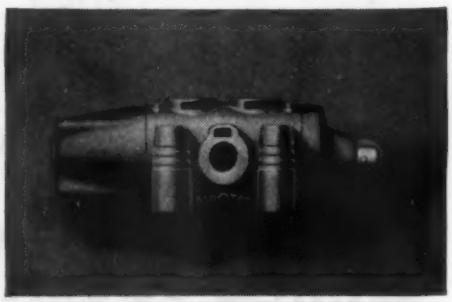
6 TYPES OF OPERATION
Hand, Foot, Cam, Solenoid, Oil operated, Air operated.

7 SIZES
¼", ⅜", ½", ¾", 1", 1¼", and 1½".

AIR PRESSURE OPERATED: Gerotor 4-Way Hydraulic Valve.



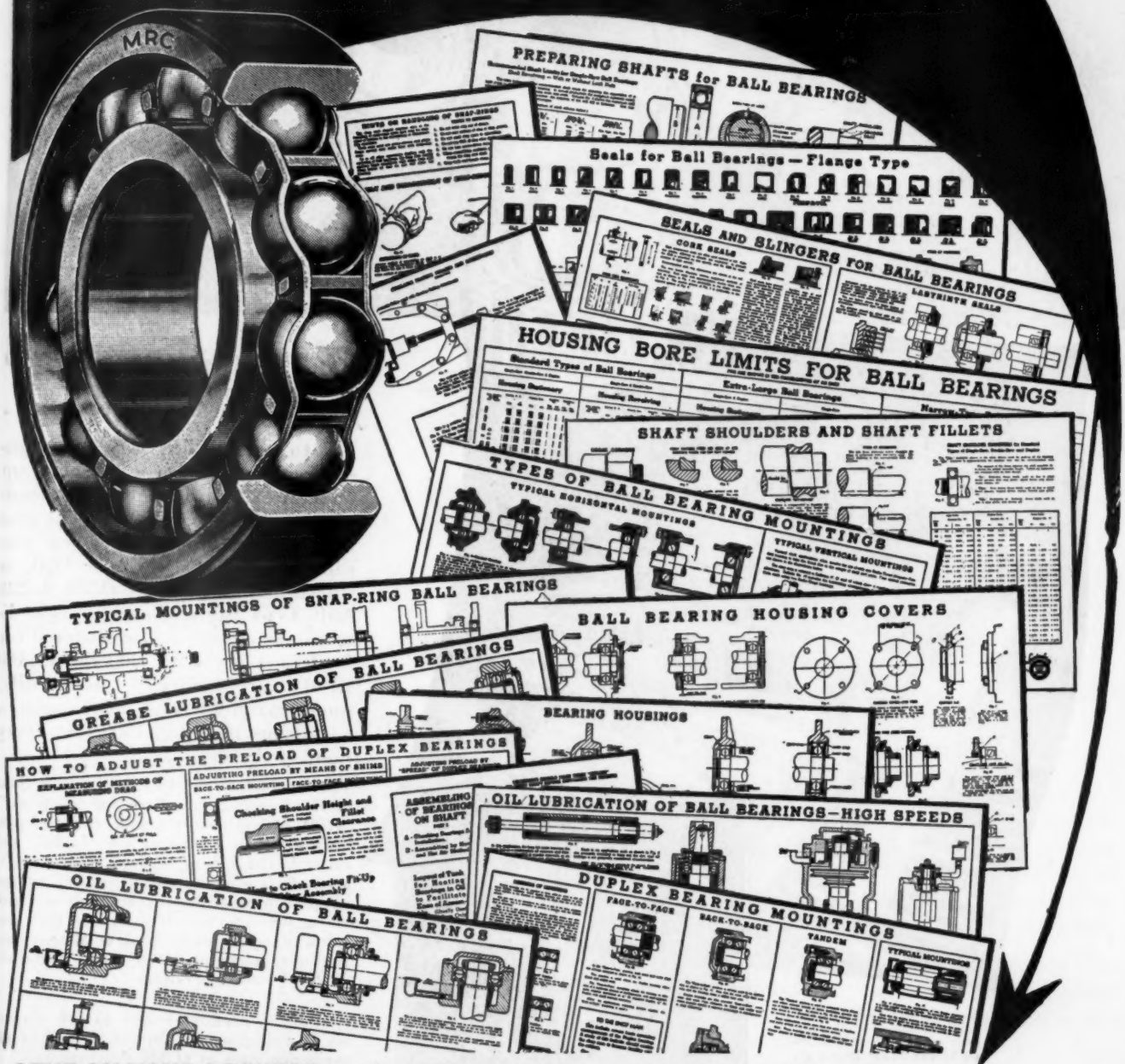
OIL PRESSURE OPERATED: Gerotor 4-Way Hydraulic Valve.



CAM OPERATED: Gerotor 4-Way Hydraulic Valve.

27 BULLETINS on

Ball Bearings—their installation, use and maintenance. Available to shop men, maintenance men, engineers, designers and draftsmen.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DUPLEX BEARING MOUNTINGS

SENT ON YOUR REQUEST; write, giving your title or position and name of company.

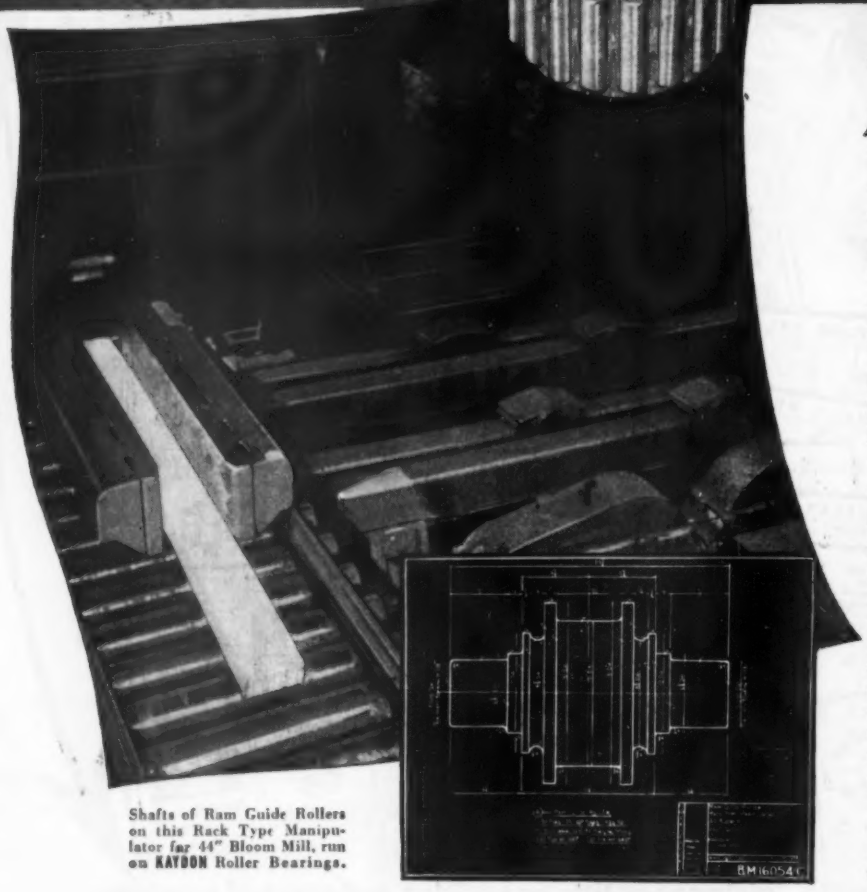
M-R-C BALL BEARINGS

MARLIN-ROCKWELL CORPORATION

Executive Offices: JAMESTOWN, N. Y.

Contact KAYDON *of Muskegon*

FOR ALL TYPES OF BALL AND ROLLER BEARINGS 4" BORE TO 120" OUTSIDE DIAMETER



Shafts of Ram Guide Rollers on this Rack Type Manipulator for 44" Bloom Mill, run on **KAYDON** Roller Bearings.

Hot and Heavy Loads for KAYDON *Bearings...*

IT takes mighty rugged high-precision bearings to stand up under terrific heat and heavy loads of white-hot steel billets passing over ram guide rollers of a rack-type manipulator in a 44" Bloom Mill, as shown here. Big, husky **KAYDON** W-228 Mill Type Roller Bearings (see dimensions above) . . . engineered for load capacity of 137,000 lbs. at 100 RPM . . . are performing successfully, under extremely high temperatures, with rams traveling 1700 feet every hour of the day.

That is typical of the many tough jobs **KAYDON** Bearings are "taking in stride". **KAYDON**, specializing in engineering and production of all types and sizes of ball and roller bearings from 4" bore to 120" O.D., also offers complete facilities for atmospheric controlled heat treating, flame hardening, precision heat treating, salt-bath and sub-zero conditioning and treatment, microscopy, physical testing, and metallurgical laboratory services.

• • •

Counsel in confidence with **KAYDON**. Capacity is available now for production of all types and sizes of **KAYDON** Bearings.

THE KAYDON ENGINEERING CORP.

KAYDON *Types of Standard or Special Bearings:*
Spherical Roller • Taper Roller
Ball Radial • Ball Thrust
Roller Radial • Roller Thrust

MUSKEGON • MICHIGAN

New in Name . . . Old in Experience

CENTURY MOTORS

Totally Enclosed Fan Cooled

Provide
POSITIVE PROTECTION
Against

- ✓ Chips
- ✓ Metallic dusts
- ✓ Abrasive dusts
- ✓ Metal cuttings
- ✓ Coolant fog or mist
- ✓ [illegible]-laden dust
- ✓ Any non-explosive hazard

Century 7½ horsepower Totally Enclosed Fan Cooled Motor furnishes power for an automatic lathe.

Longer motor life is assured when Century Totally Enclosed Fan Cooled Motors are used in destructive atmospheres. This is true for two major reasons:

1. The inner sealed frame of these motors prevents dusts, dirt, oils, mist, etc., from attacking motor insulation, windings, and bearings.
2. A large, enclosed fan provides effective cooling through large air passages. A controlled blast of cooling air carries heat away from active magnetic material and motor bearings.

Specify Century Totally Enclosed Fan Cooled Motors — be sure of protection that will keep your machines operating in any kind of destructive atmosphere.

Century Motors are available in a wide range of types and sizes from 1/20 to 600 horsepower.

Century C MOTORS

CE 444

CENTURY ELECTRIC CO.
1806 Pine Street
St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

Let Mullins check your new designs

1 **The proper use** of metal stampings can simplify that new post-war product of yours, and reduce its cost. But where should you use stampings? Let Mullins' stamping engineers help you decide . . .

2 **Mullins knows how** to use pressed metal to best advantage. Intricate castings or forgings can be replaced by lighter stampings of equal strength. Many complicated close-tolerance parts can be made by brazing or welding stampings together . . .

3 **These refinements** in design will probably change your production set-up. Mullins' engineers can often eliminate several assembly operations by supplying you with prefabricated parts . . .

4 **If you find** you can use Mullins Service, you know in advance exactly what it will cost. Mullins submits a complete production proposal for your approval . . . giving you an accurate check on the savings made possible by stampings . . .

5 **Production** of parts for your product starts with the making of dies. Here, Mullins' experience is a definite help. Mullins knows how to make dies that eliminate stamping operations, forming complicated parts to close tolerances . . .

6 **Some of** the largest presses in existence are ready to make your parts in Mullins plants. Mullins can produce any quantity of medium or large size stampings you need, and deliver on a schedule that exactly meets your production plans . . .

Manufacturers of
Youngstown Kitchens
by Mullins

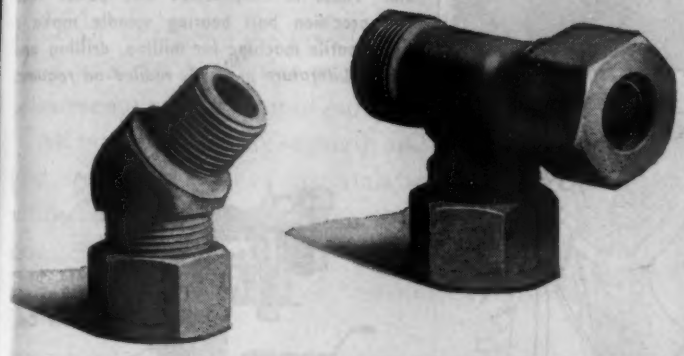
Every manufactured article you buy and sell helps maintain national prosperity by keeping men and dollars at work.

Mullins Manufacturing Corporation
Salem, Ohio
Plants at Warren and Salem, Ohio

A day or two spent with Mullins' engineers has shown dozens of manufacturers how to make a good product better, and make it at lower cost. Even if you have a design that "can't use stampings" it may pay you to have us look it over. We have made a good many "impossible" stampings in our 50 years of experience, and in each case the product was improved. We'd like a chance to check your designs before they get too far along. Our engineers are ready to work with you right now. Just tell us what you're going to make and when we can help you with your plans.

Mullins

LARGE PRESSED METAL PARTS . . . DESIGN ENGINEERING SERVICE
PORCELAIN ENAMEL PRODUCTS



They're different

they're improved Ermeto fittings!

Weatherhead Ermeto fittings are made in all sizes and types. They can be furnished in O.D. tube or in nominal pipe sizes from $\frac{1}{8}$ inch to 2 inch O.D. Ermeto fittings for special installations are also available for a wide variety of uses. These fittings have been field tested and approved in thousands of installations on hydraulic, oil, water, gas and fuel lines. They will withstand excessive vibration for an indefinite period and hold beyond the burst strength of the tube itself. For information or literature, write or phone any Weatherhead branch office.

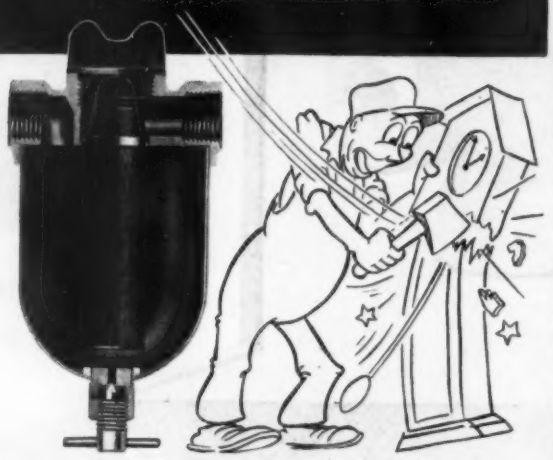
Write today for this new Ermeto catalog. It's free!

Look Ahead with Weatherhead

THE WEATHERHEAD COMPANY, CLEVELAND 8, OHIO

Branch Offices: New York, Philadelphia, Detroit, Chicago, St. Louis, Los Angeles

Norgren FILTERS



CUT DOWN TIME FOR REPAIRS PUT PLUS IN PERFORMANCE

Protect your pneumatic tools and cylinders from scoring and excessive wear due to airborne rust, grit pipe scale; oil emulsion and moisture. Norgren Filters prevent these "gangsters" from reaching the tool.

Compact, accurately machined unit with double thick Monel wire screen. No moving parts to get out of order. Easily cleaned—dirt falls to the bottom of the bowl; simply open the petcock, blow it out.

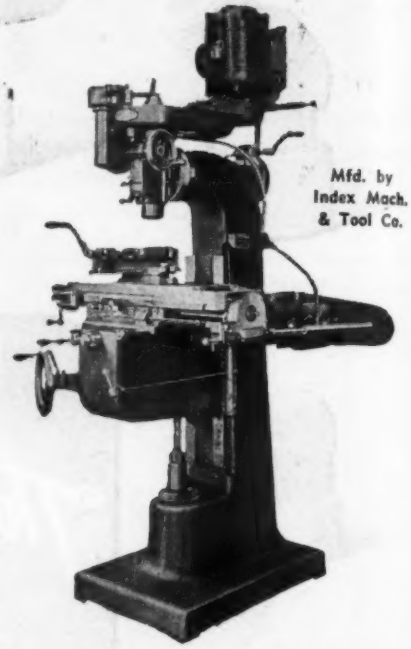
You get peak performance at bedrock costs when your air tools and cylinders are protected by Norgren Filters.

WRITE FOR CATALOG 400. C. A. Norgren Co., 220 Santa Fe Drive, Denver 9, Colorado.

Norgren

INDEX MILLS

will help you on your tool, die and production work. In addition to micrometer dials on screws, verniers are standard equipment for cross and longitudinal locating. If finer precision is desired, rods and indicators are available. These in conjunction with power feed to a precision ball bearing spindle make a very versatile machine for milling, drilling and boring. *Literature promptly mailed on request.*



Mfd. by Index Mach. & Tool Co.

12" Tool Room Rotary Table

A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

BLANK and BUXTON MACHINERY

3100 E. MICHIGAN AVE. JACKSON, MICH.

All are flexible . . . yet each is designed to do a SPECIFIC JOB

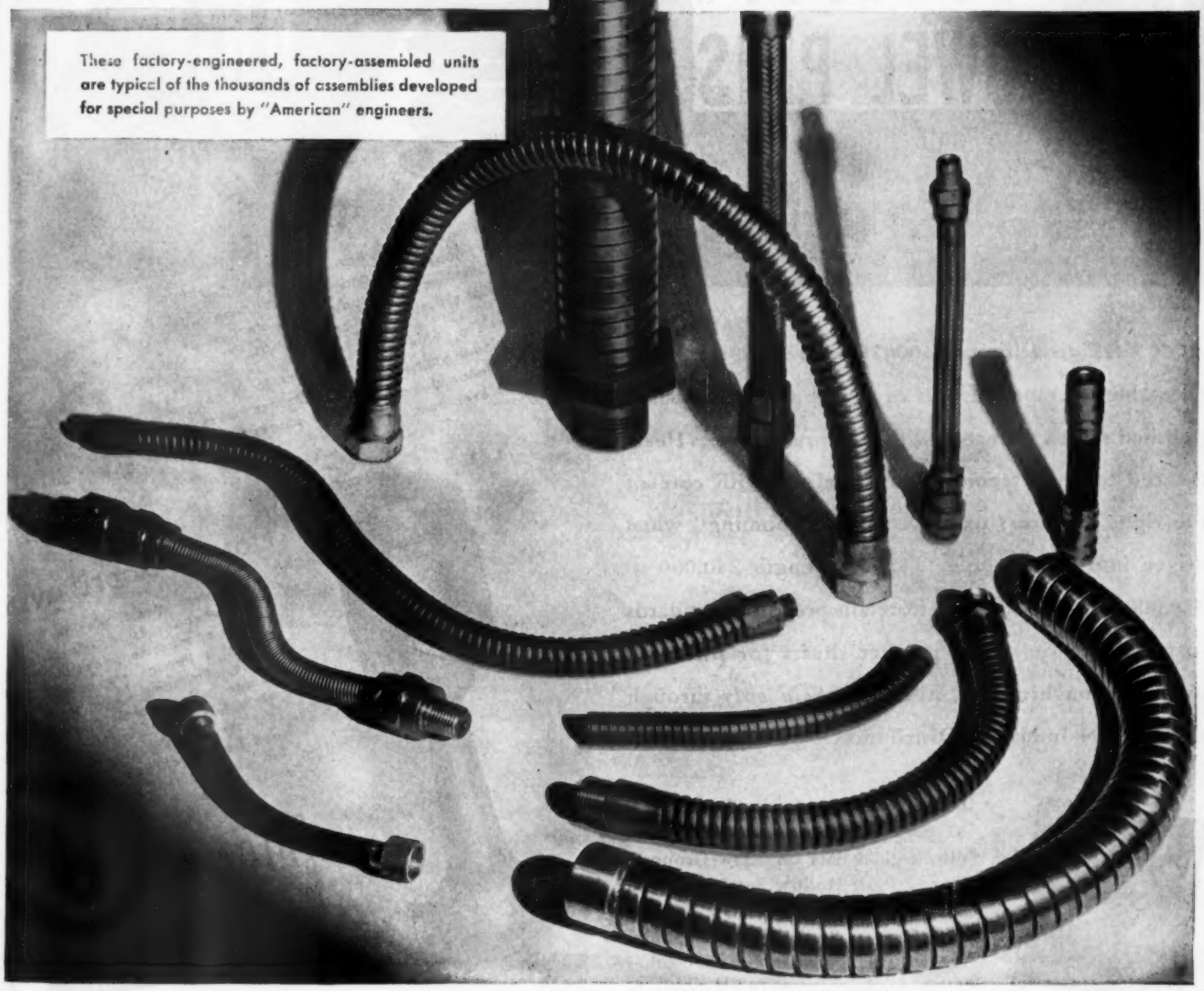
EACH OF THESE flexible metal assemblies has successfully solved a particular problem of vibration, misalignment or movement of parts.

All possess adequate strength and flexibility and are constructed of materials well able to withstand the abrasive and corrosive conditions encountered.

A similarly "tailor-made" assembly can be developed to meet *your* needs. American Flexible Metal Hose or Tubing is made in a wide range of sizes, metals and types of construction. In addition, the broad, practical experience of our Technical Department is at your disposal.

Take advantage of these facilities. For detailed information write for Publication SS-50.

Buy Victory Bonds . . . Help Assure World Peace



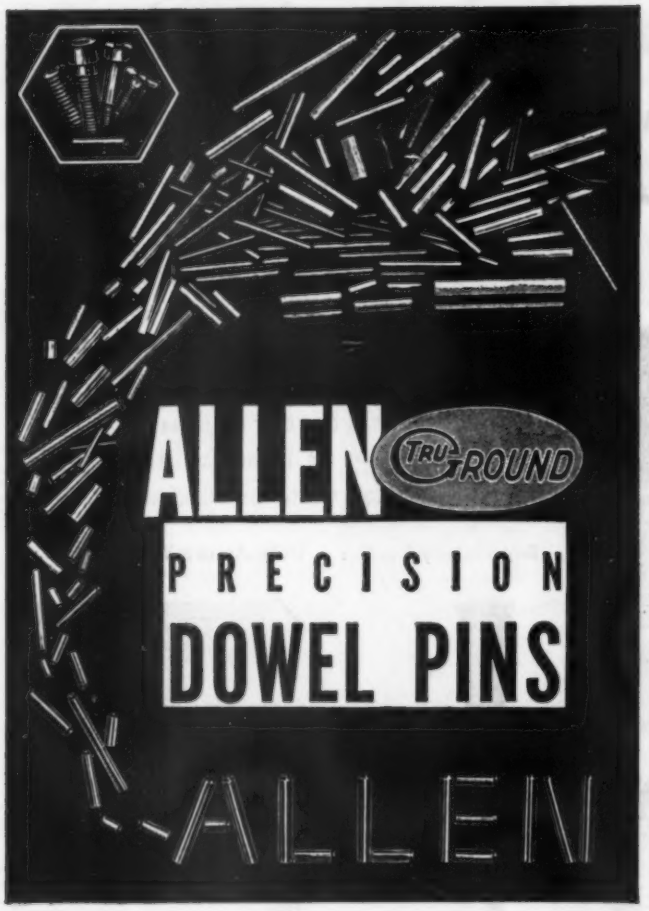
These factory-engineered, factory-assembled units are typical of the thousands of assemblies developed for special purposes by "American" engineers.

ANACONDA

American Metal Hose

AMERICAN METAL HOSE BRANCH OF THE AMERICAN BRASS COMPANY • General Offices: Waterbury 88, Conn.

Subsidiary of Anaconda Copper Mining Company • In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*



ACCURATE to a limit of .0002" over basic size, with allowable tolerance of plus or minus .0001". Ground, polished surfaces, treated with rust-preventive... Heat-treated to an extremely hard surface, with core of the right hardness to prevent "mushrooming" when driven into a tight hole. Tensile strength 240,000 to 250,000 p. s. i. . . Steeled to retain precision standards in tool and die work; perfect shafts for pins and pivots in machine assemblies. . . *Sold only* through your ALLEN Industrial Distributor.

Let us send you a copy of the ALLEN 32-page Catalog of descriptive and dimensional data on "Tru-Ground" Dowel Pins, Hollow Set Screws and Socket Head Cap Screws, Flat Head Cap Screws, Socket Head Shoulder Screws, Hexagon Key Kits and other Allen products of prime interest in simplifying your fastening problems.

THE ALLEN MFG. COMPANY
HARTFORD, CONNECTICUT, U. S. A.

★ When the chips turn blue, the air frequently does, too, for it means a high speed tool bit needs regrinding. But chips don't come up blue when the proper coolant is used . . . and the best way to get coolant to the junction between tool and chip is with a Pioneer Pump.

Pioneer Pumps are "blue chip" performers on all heavy duty or high finish operations. Milling, turning, drilling, sawing, reaming, tapping, hobbing, broaching or grinding . . . every operation and every machine will benefit from the steady, adequate flow of coolant supplied by Pioneer Pumps.

There's a "blue chip" performer to fit any machine in your shop . . . for Pioneer makes 400 standard models of the longest-lived pumps ever built.

PIONEER MODEL MVBD

Seal-less model designed to mount on outside of coolant tank or machine pedestal. Intake is through mounting pad hole, eliminating intake piping. Three outlets permit piping to right, left or back into the coolant sump. Will stay primed and function efficiently in shallow places out of the reach of most pumps.

PIONEER Pumps
HIGH EFFICIENCY • LOW POWER CONSUMPTION
GREATER VOLUME AND LESS MAINTENANCE

Pioneer Pump & Manufacturing Co.
19651 JOHN R ST. • DETROIT 3, MICHIGAN

Why don't you get together on proof that you both can count on?

Confidential note to machine-builders and manufacturers of mechanical products (with a couple of side remarks to users):—

It's as simple as this: Build into your machine or product, as an integral part, a Veeder-Root Counting Device that registers strokes, turns, pieces, trips, and many other units of performance . . . mechanically or electrically. Then your customers can *see* when your guarantee period is reached . . . for the Facts-in-Figures are right there in front of them in plain, bold black and white. So there's no room for argument, no needless loss of goodwill or future business through lack of positive proof.

There are Veeder-Root Devices that will record the exact number of performance-units constituting the guarantee period. And then these devices will go on proving to your customers that they're getting all the performance you built into your product. You are invited to take "*Count*sel" with Veeder-Root engineers, who will show you just how you can protect and profit yourself with built-in Veeder-Root *Count*rol.

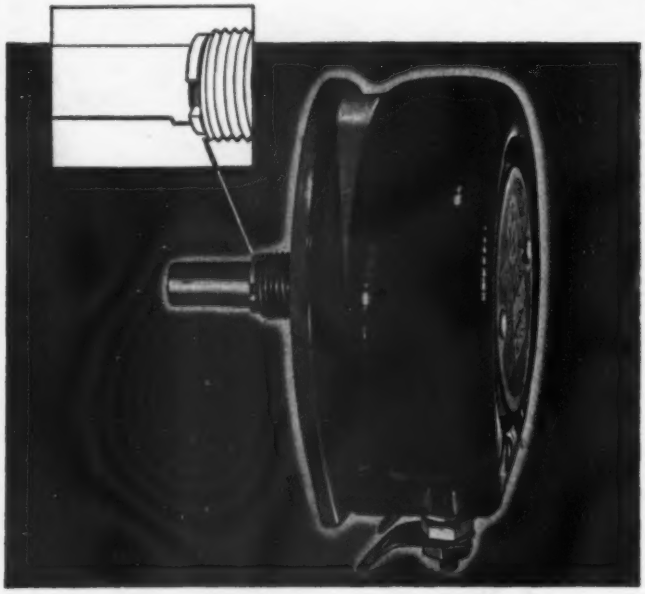
The Counting House of Industry

VEEDER-ROOT INC.

Hartford 2, Connecticut

In Canada: **Veeder-Root of Canada, Ltd., Montreal**
In England: **Veeder-Root Ltd. (New address on request)**

LET A SIMPLE RETAINING RING SAVE METAL AND MONEY FOR YOU



Every shoulder on your machines or on your metal products should be examined to see whether or not smart engineering could take advantage of these modern artificial shoulders on shafts or in housings.

It is needless waste in most instances to turn your shoulders by cutting down larger shafts, when you can groove a smaller shaft and apply a spring steel retaining ring. You'll get excellent results at unbelievable savings.

It's expensive to hold a mechanism in place with unnecessarily big shoulders or collars,—or to temporize with small cotter pins, etc. Let us show you how spring steel retaining rings can do a thoroughly efficient job for you.

More and more retaining rings are being used in these days of necessary economy. Every ounce of metal and every cent of cost is more important today than ever before.

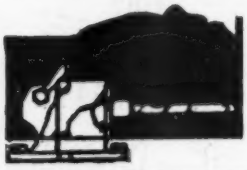
Write today for our descriptive folder on Retaining Rings.

THE NATIONAL LOCK WASHER COMPANY
Newark, N. J., Milwaukee, Wis., U. S. A.

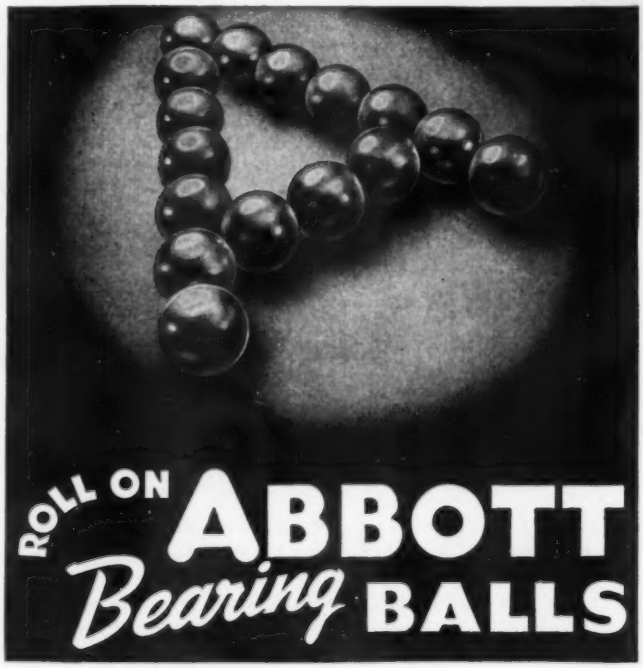
Announcing MEAD MIDGET AIR CLAMPS

Horizontal and Vertical!

Both models deliver 80 lbs. pressure on a line pressure of 100 lbs. They'll save countless man-hours in assembly operations involving welding, riveting, bolting, etc. *Advantages over mechanical clamps:* 1. Any number can be operated by single master valve. 2. Easily installed in cramped corners. 3. Equal ram pressure at any stroke point. Send for new Mead AIR POWER Catalog, describing our line of Air Clamps, Air Vises, Air Presses, Work Feeders, Valves, Controls, etc.



MEAD SPECIALTIES COMPANY
4114 NORTH KNOX AVENUE
DEPT. MA-115 • CHICAGO 41, ILL.



. . . and
WIN OVER FRICTION

SPECIFY "ABBOTT" and be sure
THE ABBOTT BALL COMPANY
HARTFORD 10 CONN., U. S. A.

with greater safety... less noise... and greatly increased efficiency!

To make certain there would be no failure of the forges—the fiery heart of locomotive shops—one railroad replaced a less efficient power drive with Dayton V-Belts on the huge blower that creates the air blasts for many forges. This Dayton V-Belt drive is operating continuously under steady load, and the management reports a greatly increased efficiency over the old type drive, *plus* the elimination of a bad safety hazard, and a considerable reduction in noise.

The ability of Dayton V-Belts to handle the toughest power transmission drives is a result of Dayton's 40 years of research and technical experience gained in manufacturing natural and synthetic rubber products. Your Dayton V-Belt Distributor can put this experience to work for you quickly and profitably. He is as near as your telephone. Call him today!

THE DAYTON RUBBER MANUFACTURING COMPANY
DAYTON 1 • OHIO

V-Belts by

Dayton Rubber

REG. TRADE MARK THE DAYTON RUBBER MFG. CO.

THE MARK OF TECHNICAL EXCELLENCE IN SYNTHETIC RUBBER

THE WORLD'S LARGEST MANUFACTURER OF V-BELTS

The "HELLCAT" walks on COLMONOY

Colmonoy Sweat-on Paste is applied at three points on the track links. The Hellcat "walks on Colmonoy".

Colmonoy is combined with the parent metal of the links by electric arc-welding.

● The "Hellcat" is a tank destroyer of exceptional maneuverability. It has a speed of up to 55 miles an hour, and carries a 76-millimeter gun of high velocity and destructive fire power. The "Hellcat" was designed and manufactured by Buick Motor Division of General Motors Corporation.

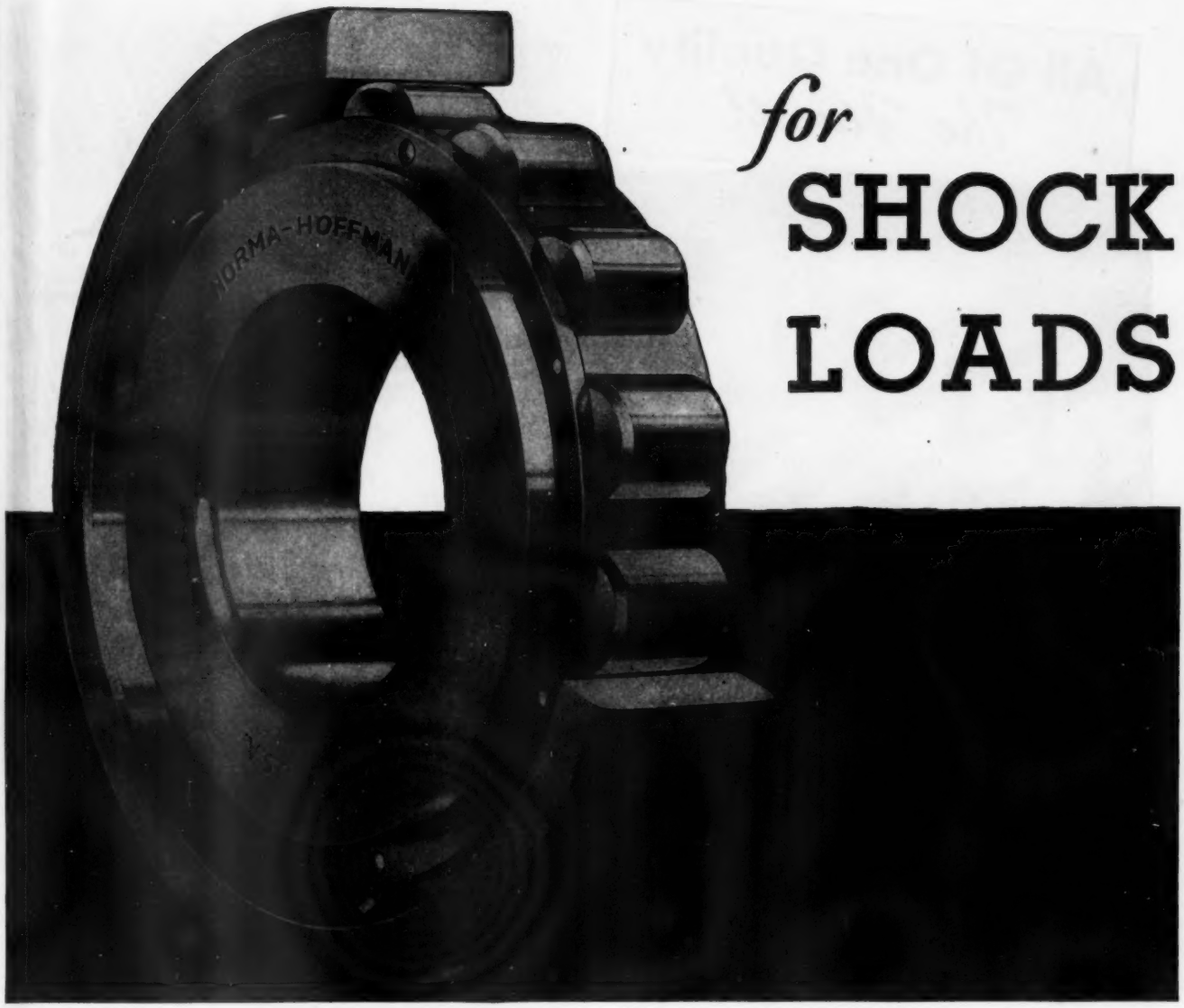
The carbon steel forged track was one reason for the tremendous success of this weapon in the European theater of operations. Track design, a new type of suspension and long service life made this track outstanding.

And about six square inches of Colmonoy per link, from 1/16" to 1/8" thick, was a big factor in the long life of the track.

There are three deposits of Colmonoy on each link. Colmonoy Sweat-On Paste is applied with a putty knife, through openings in a template, and arc-welded. The fused layer of Colmonoy hard-facing extends about 1/8" into the forging, and has a hardness of 65 Rockwell C, providing increased resistance to impact and abrasion, making each link practically wearproof.

Colmonoy Hard-Facing Alloys are available in many grades. Our catalog gives full information. Write for it.

WALL COLMONOY
Corporation
720 FISHER BLDG., DETROIT 2, MICH.



for SHOCK LOADS

ADD shock load and vibration to an extremely severe steady load—and you have a set of conditions that tests the strength and endurance of any bearing. It is under such conditions that NORMA-HOFFMANN PRECISION ROLLER BEARINGS show their superiority.

Equipped with solid cylindrical rollers between cylindrical races, NORMA-HOFFMANN ROLLER BEARINGS provide maximum load contact area—which means correspondingly increased capacity for both steady loads and overloads, together with greater shock resistance than any other type of single-row bearing affords.

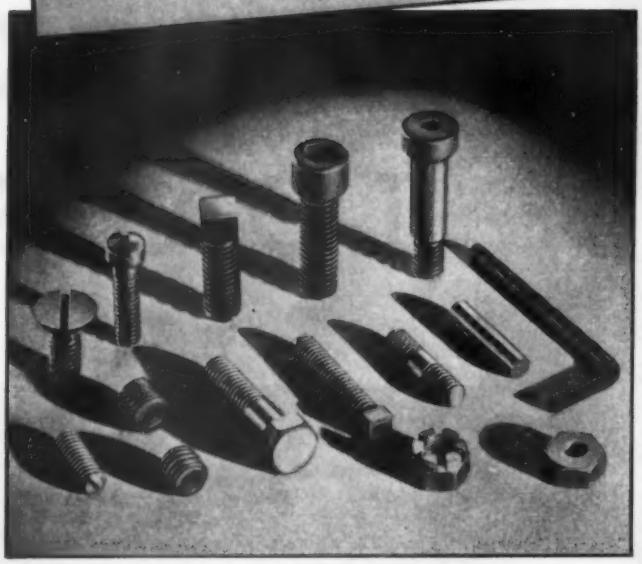
Moreover, they employ a heavy-duty, balanced, extruded bronze retainer—riding on the inner ring shoulders and relieving the rollers of its weight—that insures added durability. And their PRECISION qualities make them suitable alike for low and high speeds. . . . . Write for the Catalog. Let our engineers work with you.

"NORMA-HOFFMANN"

PRECISION BALL, ROLLER and THRUST BEARINGS

NORMA-HOFFMANN BEARINGS CORPN., STAMFORD, CONN. U.S.A.

All Of One Quality
The Finest!



Chicago Standard Screw Products are manufactured from finer materials and are unsurpassed for their increased strength, greater accuracy and perfect uniformity.

Chicago "SAFETY PLUS" Line includes:
Socket Head Cap Screws • Socket Set Screws • Stripper Bolts • Square Head Dog Point Set Screws • Socket Pipe Plugs • Keys for Socket Screw Products.

Complete Line includes:
Hexagon Head Cap Screws • Square Head Cup Point Set Screws • Headless Set Screws • Fillister Head Cap Screws • Flat Head Cap Screws • Taper Pins • Milled Steel Studs • Semi-Finished Hexagon Nuts.

In your present plans for increased production—try "Chicago Screw"—manufacturers of precision-made Standard Screw Products.

ARMY (E) NAVY

These Fine Products are sold only thru Authorized Distributors

THE CHICAGO SCREW CO.
ESTABLISHED 1872
1026 So. Homan Avenue Chicago 24, Ill.

THERE'S as much chance for water to penetrate Fibreen as to soak through the feathers of a duck.

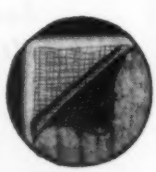
Hair pins or housing gears . . . baby buggies or bowling alleys . . . big shipments . . . little shipments . . . look alike to Fibreen when it comes to perfect protection in shipping . . . from water, dirt, dust and rough handling.

Fibreen reenforced paper is as flexible as a cord yet tough as cow-hide. It is acknowledged as the best of all by industry for any kind of wrapping job . . . small or large.

If you haven't used Fibreen to guard your goods en route to destination, by all means write today for a life-sized sample and case histories of how other manufacturers have used it.

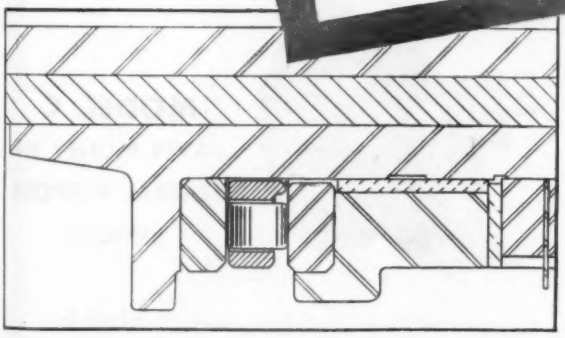
Fibreen has "dived" into many a tough shipping problem and "come up" with the right answer.

Sisal-fibre reenforcement for strength . . . special asphalt for water-proofness . . . kraft paper for clean, easy handling . . . sealed by heat and under pressure to produce Fibreen.



THE SISALKRAFT CO.
205 W. Wacker Drive · Chicago 6, Ill.
New York · San Francisco · London · Sydney
Manufacturers of
SISALKRAFT, FIBREEN, SISAL-X, SISALTAPE AND COPPER-ARMORED SISALKRAFT

KEEPING A TIGHT GRIP ON TUBING



X-Section of 17¼" I.D. x 22" O.D. Torrington roller thrust bearing, which is mounted on a hollow spindle and carries the thrust load that is used to close the gripper chuck during the cutting-off operation. Bearing capacity is 179,500 lbs. at 100 R.P.M.

This Taylor-Wilson Tube Cutting-Off machine is representative of the wide variety of uses to which Torrington Bearings are put where maintenance time-out would seriously hamper production. In the designing of the gripper chuck for this machine, a tight, unfailing grip was necessary to prevent slippage under the extreme pressure of the high-speed cutting-off operation. And it was of prime importance that the bearing used to close the chuck while the tube was being cut off be rugged, efficient and dependable.

A long-life, trouble-free Torrington roller thrust bearing was the logical solution to the problem, and the severe, full-schedule operation of these tube cut-off machines has proved again the ability of Torrington Bearings to help modern equipment do a better job.

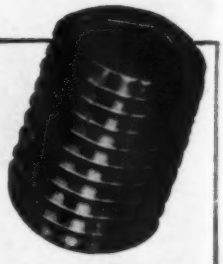
Designing and building large, heavy-duty bearings for use in the oil, steel, paper and machine tool industries is the everyday function of Torrington's Bantam Bearings Division. Our engineering department is ready at all times to cooperate with you in solving your friction problems, whether routine or unusual.

THE TORRINGTON COMPANY • BANTAM BEARINGS DIVISION
SOUTH BEND 21, INDIANA

TORRINGTON BEARINGS

STRAIGHT ROLLER • TAPERED ROLLER • NEEDLE • BALL

When you're in a TIGHT spot...specify *Mac-its*



Mac-it alloy steel hollow set screws are milled from the solid bar, with die-cut threads. Hex sockets are generated by a special process insuring full-depth accuracy. Heat-treated for maximum strength and to prevent rounding out or splitting of the socket or upsetting of the point.

Mac-it products include Socket Head Cap Screws, Hollow Set Screws, Hexagon Head Cap Screws, Square Head Set Screws, Stripper Bolts, Hexagon Socket Pipe Plugs. *All are made of alloy steel and heat-treated.*

STRONG, CARLISLE & HAMMOND CO. • Cleveland 13, O.

AISI **HY-TEN** SAE

ALLOY STEELS FOR RECONVERSION

To take advantage of up to the minute development in the metallurgy of steel before improvements can be incorporated in the natural course of events in standard steels, specify HY-TEN STEELS.

Immediate shipment from seven conveniently located stocks.

Data sheets gladly mailed on request.

"THE HY-TEN OF TODAY IS THE STANDARD STEEL OF TOMORROW"

Wheelock, Lovejoy & Co., Inc.

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Buffalo 10 — Cincinnati 32

WHEN YOU NEED PRECISION-BUILT SMALL PUMPS . . . *Specify* TUTHILL

MODEL C
SAVES MONEY IN GENERAL PURPOSE SERVICE

Recognized for low first cost, negligible maintenance and long economical service, Tuthill Model C is a dependable general purpose pump. It is simple in design, compact and built for rugged service on non-corrosive liquids. Operates efficiently in either direction of rotation. Capacities from 1 to 200 g.p.m. at pressures up to 100 p.s.i. Direct drive, belt drive, V-belt units and stripped models available. Write for Model C bulletin.

TUTHILL PUMP COMPANY
939 East 95th Street • Chicago 19, Illinois

A New kind of

DIGEST FOR MOTOR BUYERS

IT'S DIFFERENT because it doesn't attempt to give you a lot of general technical data about motors and motor selection.

This eight-page file-size folder assumes that you know what type of motor you need. It was designed to tell you, quickly, about STAR as a source of motors and generators. It shows what sizes and types are built by Star. It describes Star's way of working with customers . . . how Star becomes their "Motor Department". It gives facts about Star's pioneer achievements in motor design. It names many hard-to-satisfy motor buyers who are long-time customers.

To bring your file on leading motor sources up-to-date . . . to learn why so many prominent concerns are turning to Star Motors to power their products and production . . . attach the coupon below to your letterhead. It will also register you to receive the Complete Catalog which is in preparation.

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. . . to power the products of tomorrow . . .
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POWER PACKAGED AS YOU NEED IT

STAR ELECTRIC MOTOR CO.,
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☐ Send 8-page bulletin about Star Motors

☐ Put me on list to receive Complete Catalog

Name and position.....

Company.....

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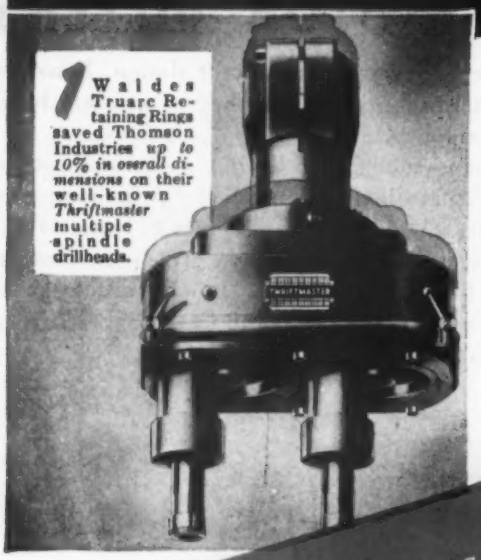
Another Proof that Waldes Truarc Retaining Rings hold moving parts together better!



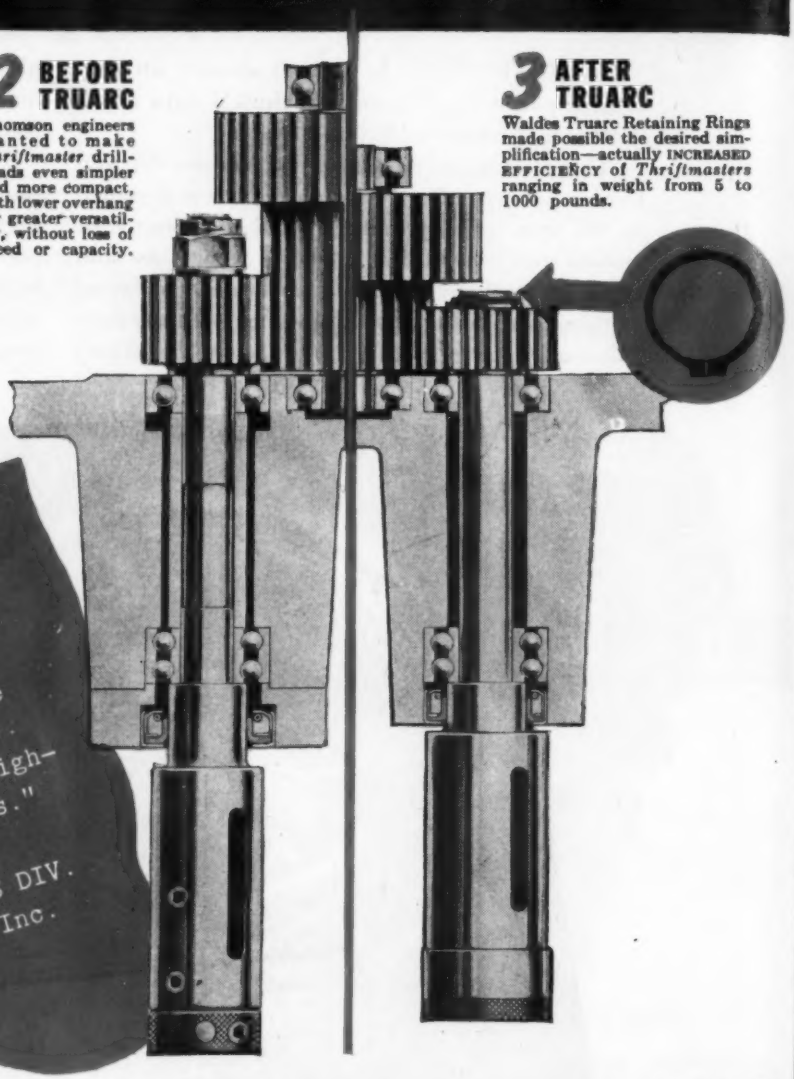
1 Waldes Truarc Retaining Rings saved Thomson Industries *up to 10% in overall dimensions* on their well-known *Thriftmaster* multiple spindle drillheads.

2 BEFORE TRUARC

Thomson engineers wanted to make *Thriftmaster* drillheads even simpler and more compact, with lower overhang for greater versatility, without loss of speed or capacity.

3 AFTER TRUARC

Waldes Truarc Retaining Rings made possible the desired simplification—actually INCREASED EFFICIENCY of *Thriftmasters* ranging in weight from 5 to 1000 pounds.

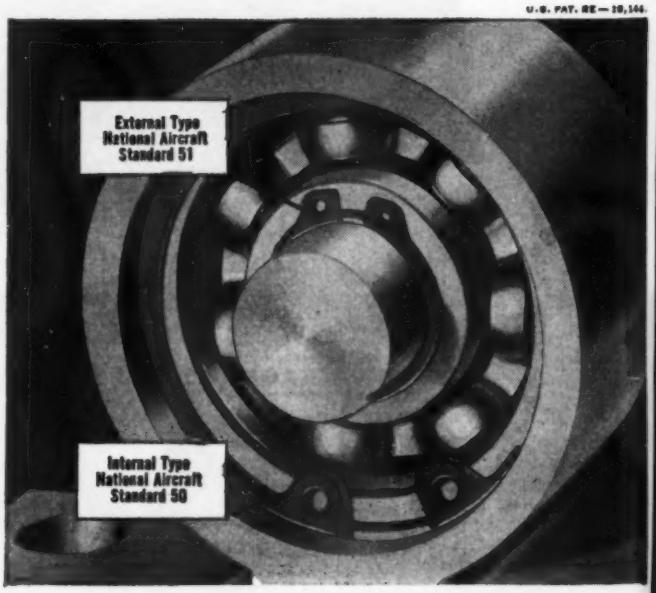


"Waldes Truarc Retaining Rings enabled us to make substantial time and labor savings in production of THRIFTMASTER drillheads...and made possible a much lighter, handier, more rugged tool, exceeding our highest performance requirements."

(Signed)
THRIFTMASTER PRODUCTS DIV.
Thomson Industries, Inc.

U.S. PAT. RE—18,144

IN HOLDING and positioning machine parts, Waldes Truarc Retaining Rings offer distinct advantages over nuts, shoulders, collars and pins. They save cost by simplifying and speeding up production. They make assembly and disassembly much quicker, easier. They can be put on and taken off time and time again—and still retain the perfectly true circularity that gives them their never-failing grip. Test Waldes Truarc Retaining rings in your products and in the machines that make them. We'll furnish samples and complete data. Write Dept. B-11.

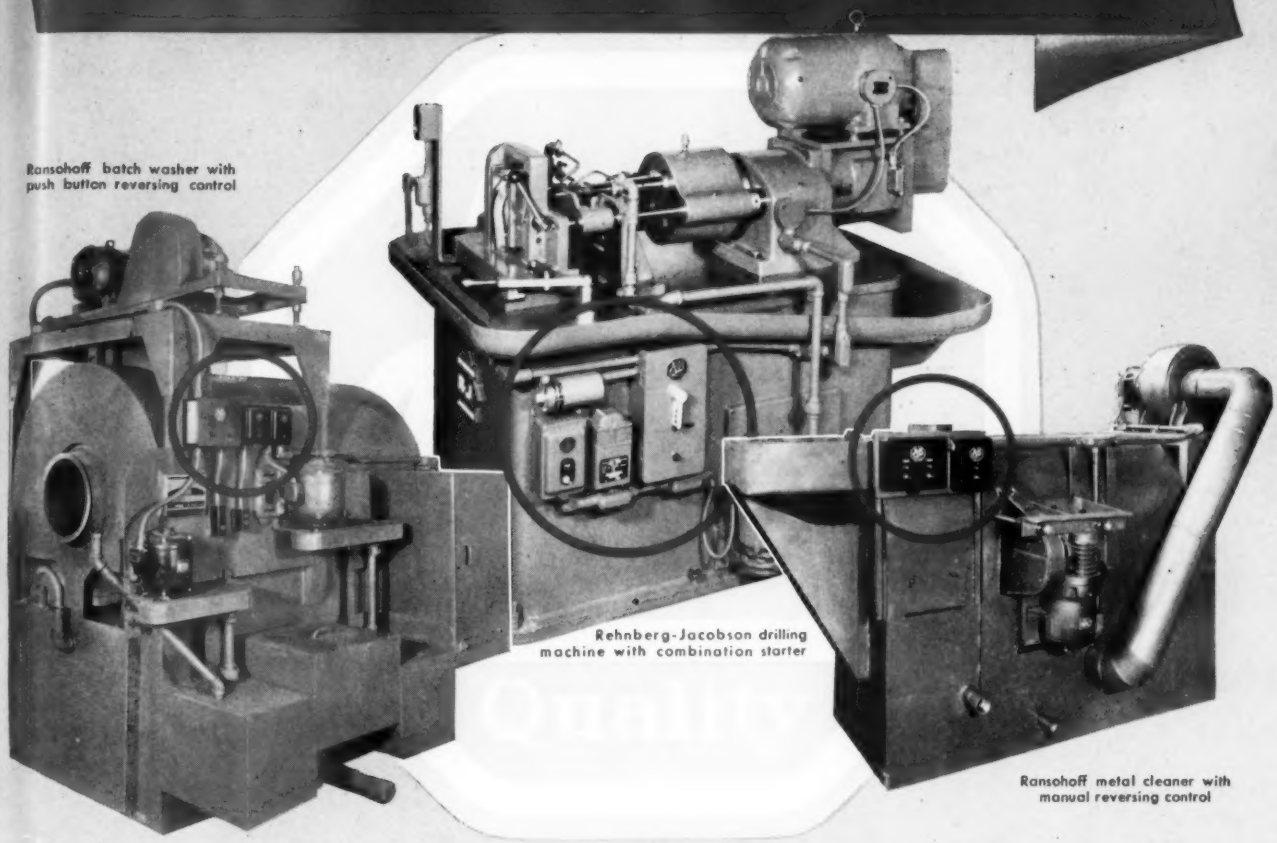


WALDES TRUARC TRADE MARK **RETAINING RING**

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

CANADIAN REPRESENTATIVES: FRENCO PROGRESS CORP., LTD., 72-74 STAFFORD STREET, TORONTO

MOST POPULAR LINE of MOTOR STARTERS



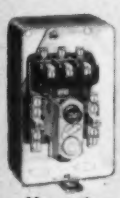
Ransohoff batch washer with push button reversing control

Rehnberg-Jacobson drilling machine with combination starter

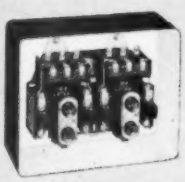
Ransohoff metal cleaner with manual reversing control

Why Machinery Designers like these A-B Size O and Size 1 Starters . . .

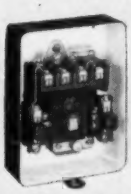
Small size . . . millions of operations . . . maintenance-free performance . . . and fine appearance . . . these are the four outstanding features which make Size O and Size 1 solenoid starters so popular with machinery designers. They know the importance of space saving . . . of trouble-free operation . . . of attractive looking control equipment. And, above all, they value the sales asset of the well-known Allen-Bradley trade mark on controls sold with their machines. It is the label of quality. There is a standard cataloged A-B unit for every need. Send for Bulletins 609 and 709 today.



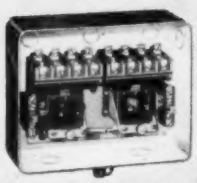
Manual



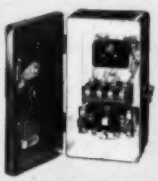
Manual Reversing



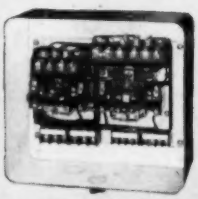
Automatic



Automatic Reversing



Combination

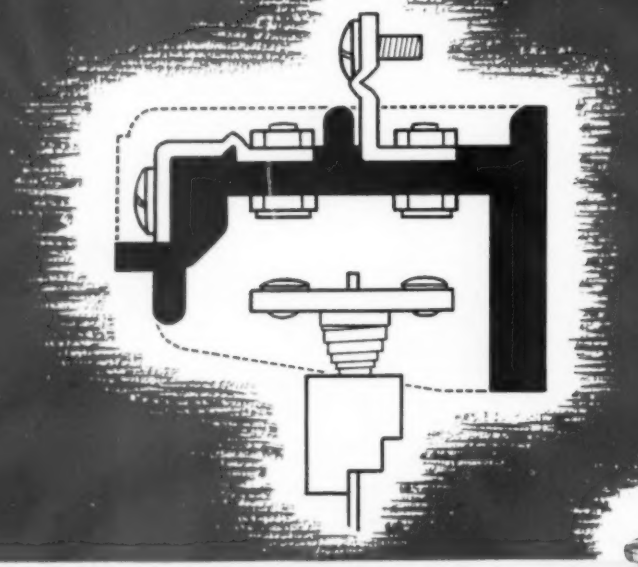


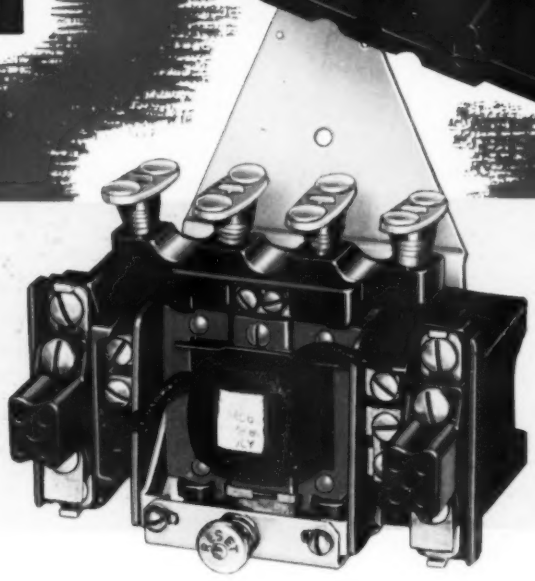
Multispeed

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY



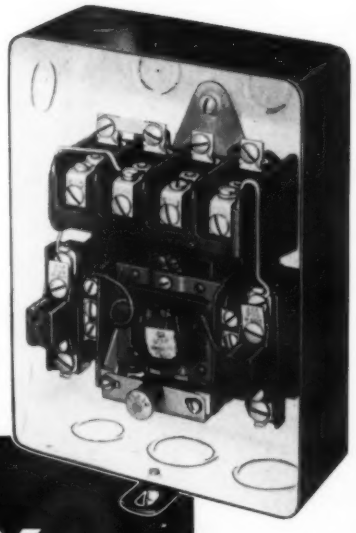


The ALLEN-BRADLEY SIZE 0 and SIZE 1 SOLENOID STARTER

So Simple ...So Trouble-Free!

Only ONE moving part . . . the simple magnetic plunger with the double break moving contacts. Like all Allen-Bradley solenoid starters, these Size 0 and Size 1 starters have no pins, pivots, or bearings to corrode . . . no jumpers to break. And the patented silver alloy contacts require no cleaning, filing, or dressing. You can install these starters . . . and forget 'em. Send for Bulletin 709.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

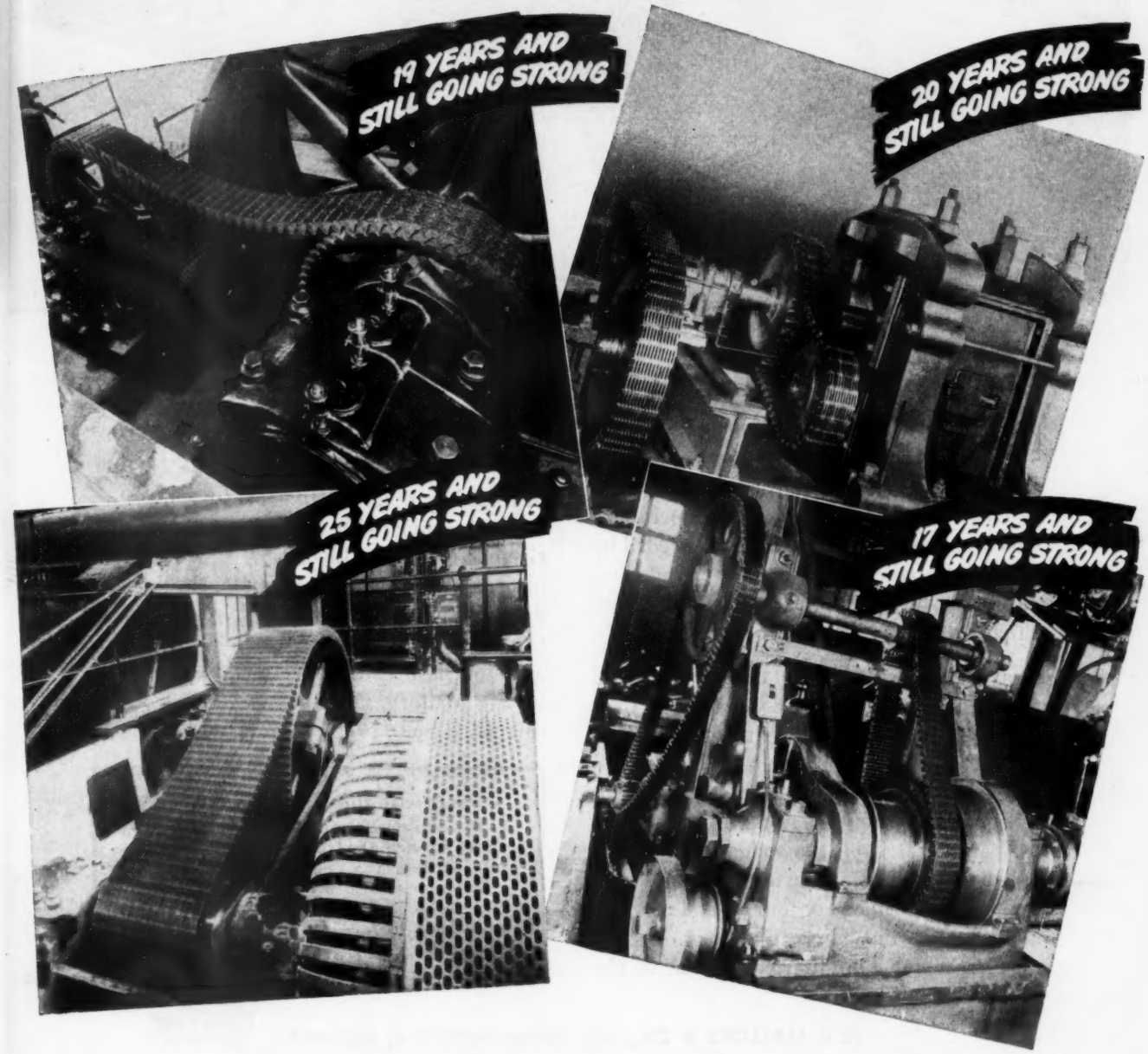


A-B Quality

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL

How Long

WILL A MORSE DRIVE LAST?


19 YEARS AND STILL GOING STRONG
20 YEARS AND STILL GOING STRONG
25 YEARS AND STILL GOING STRONG
17 YEARS AND STILL GOING STRONG

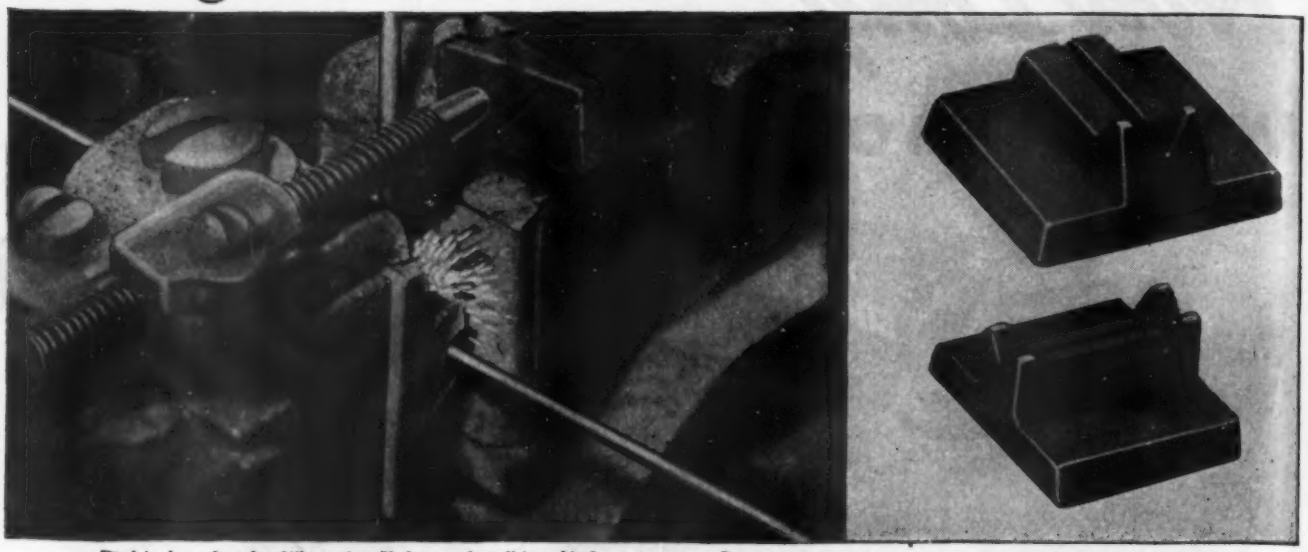
Durability in power transmission equipment is not enough . . . it has to be so efficiently designed that it "stays modern" so that plant production continues to meet modern competition. Many Morse drives in use fifteen years and longer today are just as modern in their operation and *cost of operation* as the day they were installed. Postwar's keener competition demands this type of foresighted equipment selection. Call your Morse engineer for information on how Morse drives are helping other manufacturers get top efficiency—how they can help you.

SPROCKETS CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE Roller and Silent CHAINS

MORSE CHAIN COMPANY • ITHACA, N.Y. • DETROIT 8, MICH. • A BORG-WARNER INDUSTRY

Stronger Fence Produced Faster *with*



Flash is shown for sake of illustration. Under actual conditions this does not occur.

MALLORY WELDING DIES

MILES of wire fence are turned out each day by high-speed cross-wire welders that make a series of strong joints across the entire width of the fence, in one operation. This cross-wire welding has been speeded by the use of Mallory Resistance Welding Dies, and tests show that the welded joints are actually stronger than the wire itself!

Dies of Mallory 100 Metal, now standard equipment, provide many advantages over the bronze welding dies originally used. This Mallory alloy, with its high electrical and thermal conductivity, conducts heavy welding currents without overheating and rapidly dissipates heat from the welding surface of the dies—permitting faster welding. Dies retain their correct contour over long production runs, and "down time" for dressing or replacement is minimized because of the excellent physical and mechanical properties of the Mallory alloy.

Savings in production time because of faster, better welding with Mallory Standard Resistance Welding Electrodes are commonplace throughout the metal fabricating industries. Whether you need spot welding tips and holders, seam welding wheels, or dies for flash, butt or projection welding, specify Mallory. Often a *standard* electrode will solve your problem. Consult us today.

Invaluable Information

—now available, Third Edition Mallory Resistance Welding Data Book, a comprehensive text on resistance welding practices. Sent gratis to resistance welding engineers, when requested on company letterhead. Available to students, libraries and schools at $2.50 per copy, postage paid.

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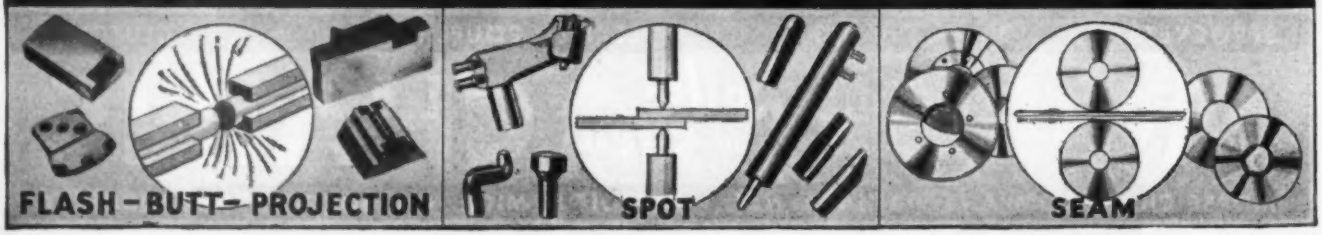
MALLORY *Standard Resistance Welding Electrodes*



Bunting manufactures not only Special Bearings to your specification but Standard Stock Bearings and Precision Bronze Bars. On Special Bearings our engineers will be glad to work direct with you. Standard Stock Bearings and Precision Bronze Bars are available from your nearest Authorized Bunting Distributor. The Bunting Brass & Bronze Company, Toledo 9, Ohio.
28
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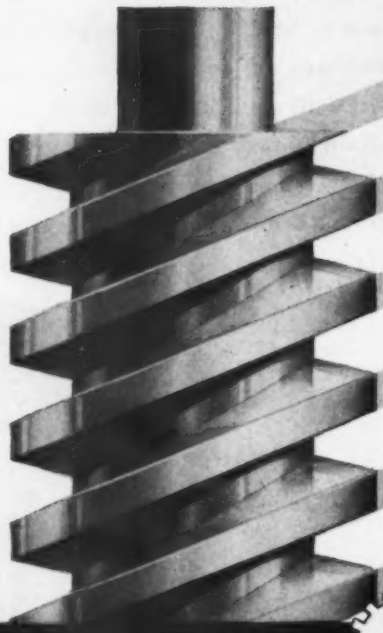
BRONZE BEARINGS ☆ BUSHINGS ☆ PRECISION BRONZE BARS

THE ART OF ACCURACY



QUAKER CITY CRAFTSMEN, USING THE MOST MODERN MACHINES PRODUCE PRECISION GROUND FORM WORMS . . . OUR RIGID STANDARDS ARE NOW MEETING EXACTING DEMANDS OF THE ELECTRONICS INDUSTRY . . . YOUR INQUIRY WILL BE APPRECIATED AND WILL BE GIVEN PROMPT ATTENTION.

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Straight — Spiral Teeth

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OUR SERVICE INCLUDES:

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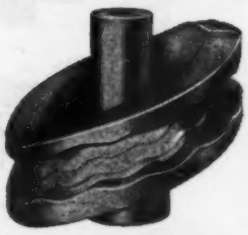
You plan and we execute—assuring speedy production, prompt delivery and reasonable price. Send blue prints or samples for estimate.



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HARTFORD, CONN.

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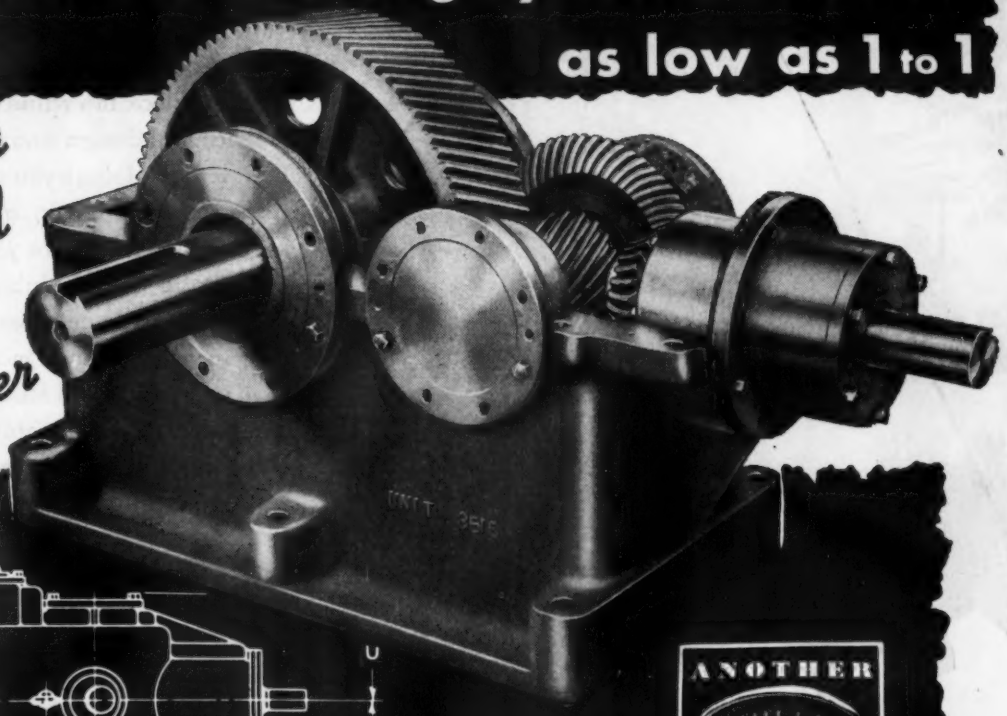
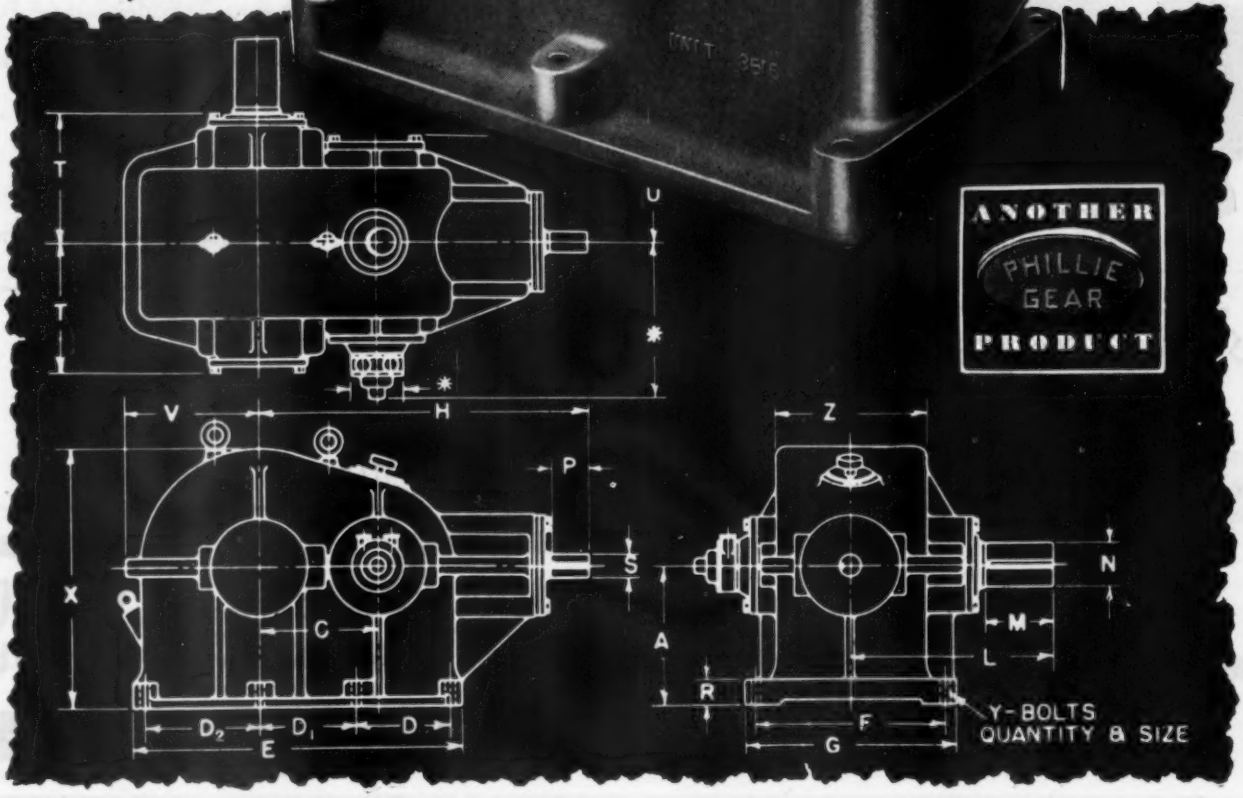
The Philadelphia Spiral-Bevel Speed Reducer





Yes, believe it or not, these Units have the same *high efficiencies* as parallel shaft herringbone units, and they require no "cooling system" to keep the working temperatures within safe limits. And, they may often be used where a Worm Gear Reducer would not be recommended.

Available in Single, Double and Triple Reductions, these High Quality Speed Reducers may be had to take care of ratios from 1 to 1, up to 238 to 1. Send for complete catalog No. 200.

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Industrial Gears and Speed Reducers
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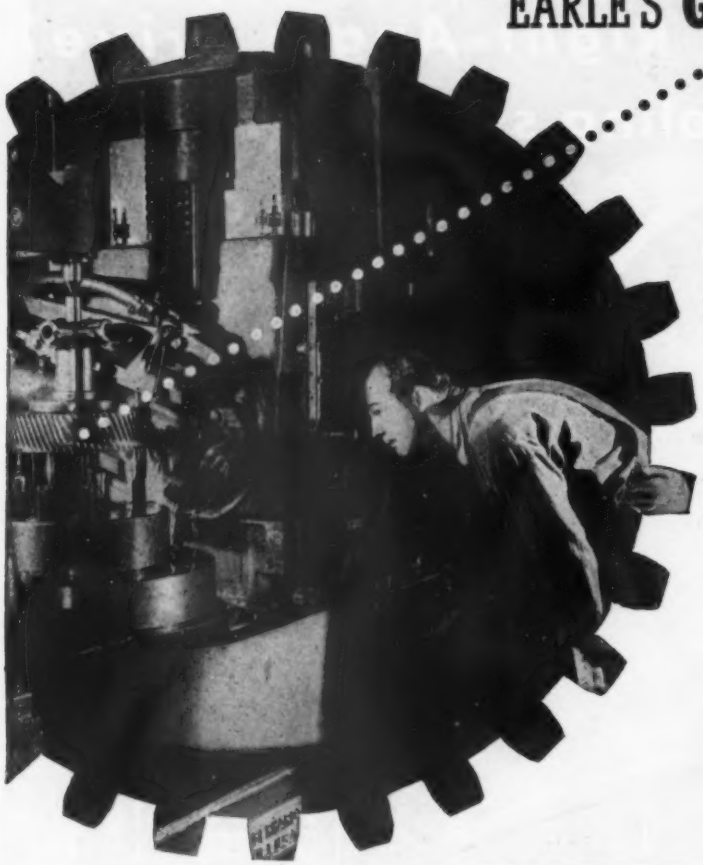

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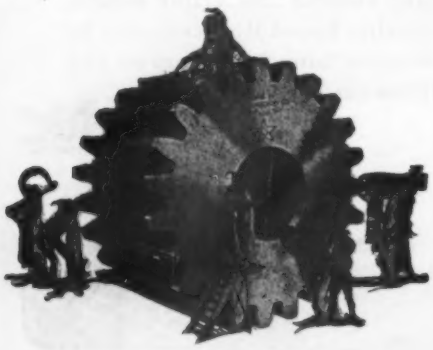

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Better Gear Products

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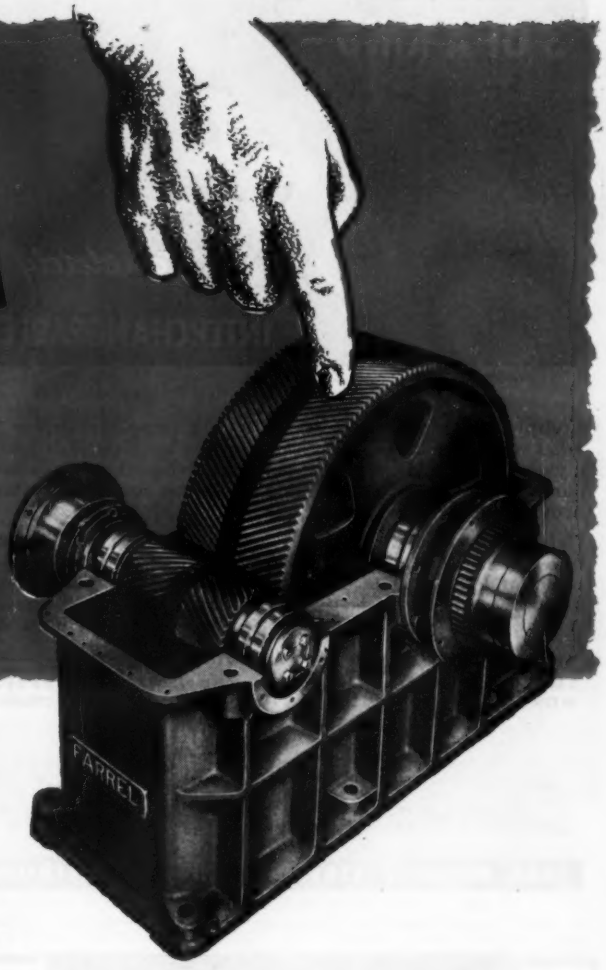
You can *put your finger on the* **EXTRA** **LOAD-CARRYING CAPACITY** in these



SPEED REDUCERS

ONE look at the continuous tooth herringbone gears in a Farrel Speed Reducer tells you what gives these gears their extra strength and load-carrying capacity.

In place of the center groove found in some herringbone gears, you see the extra tooth area formed where the helices meet to make the teeth continuous across the face. This extra tooth area is known as the *backbone.* It puts the entire width of the gear to work, providing greater capacity to withstand shocks, stresses and heavy loads.

Precision generated by the famous Farrel-Sykes process, the *Gear with a Backbone* is widely known throughout industry for its smooth, quiet, efficient operation. Its combined characteristics of overlap or interlacing of the teeth, gradual engagement and inclined line of pressure distribute the load on the teeth uniformly, reducing wear and maintaining correct tooth action through a long gear life.

Other features which contribute to smooth, efficient power transmission in Farrel Speed Reducers include rigid and accurately ground shafts properly mounted in roller bearings, and heavy section cases that hold rotating elements in precise alignment.

These speed reducing units are available in a complete range of sizes for any capacity. Ratios of single reduction units range from 1¼:1 to 10:1, double reduction units up to 60:1, and triple reduction units up to 180:1. Write for descriptive Catalog No. 438.

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Plants: Ansonia, Derby and Stonington, Conn., Buffalo, N. Y.
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FB-230

Complete interchangeability is highly important today in units which operate continuously or for long periods under a variety of conditions. If breakdown should occur, a new part may easily be installed and operation resumed in short order.

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SPUR, HELICAL, BEVEL, SPROCKETS AND SPLINES

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MADE FROM ANY MATERIAL
***Exactly* TO YOUR SPECIFICATIONS**

DETROIT *Bevel* *Gear* COMPANY

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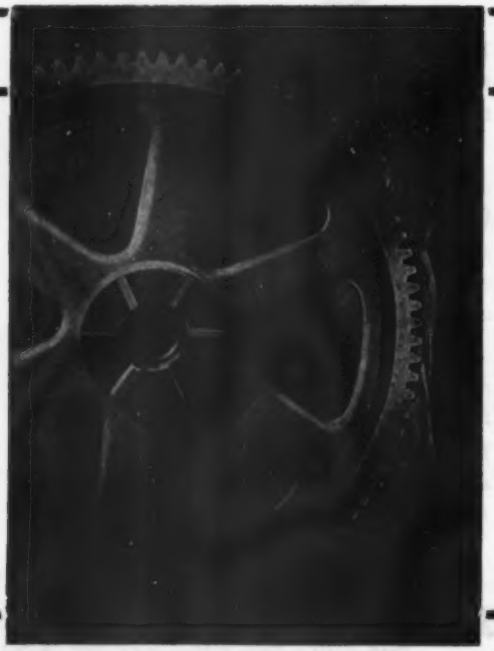

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If the close tolerances in your product make it look like a mass production headache—let Sier-Bath gear it. Our machinists hold extremely high dimensional uniformity—even to tolerances as close as .0001" through long runs with rare rejects. They have the latest gear cutting and heat treating equipment and they are the kind of men found wherever there are good employee relations and modern conveniences. Write us or better still, see us.

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OF FRAMINGHAM

50th Anniversary
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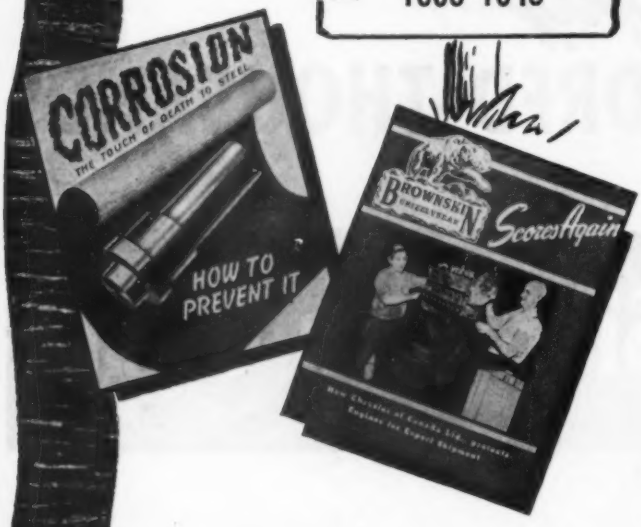

Two preferred war wraps now available to peace-time industry

Two colorful folders illustrate the story. Send for them if you are interested in newer and better ways to protect metal products from corrosion — from all kinds of wet-dirt-moisture damage while in transit or in storage.

How INDUWRAP, because of its exclusive engineered features, won the battle against corrosion for builders of airplane engines and many highly-finished precision parts. How BROWNSKIN GRIZZLYBEAR (A-19) helped to solve the problem of delivering engines safely overseas.

These two wraps, and many others of Angier make, have proved in war their quality-right to lasting preference in peace. They come from the house that has devoted a half-century of protection to the products of our nation and its industries — in peace and war.

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"64 YEARS" MANUFACTURING GEARS

Despite the continued growth of our gear business we are still in position to give each customer the attention they have a right to expect.

We carry a complete stock of standard cut gears and can furnish special gears to your specifications.

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ESTABLISHED 1877
GEAR
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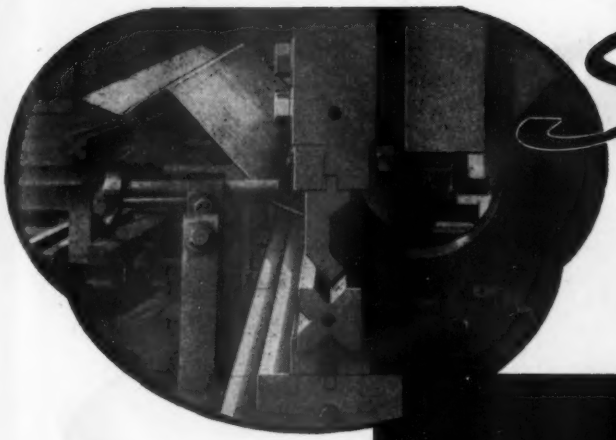

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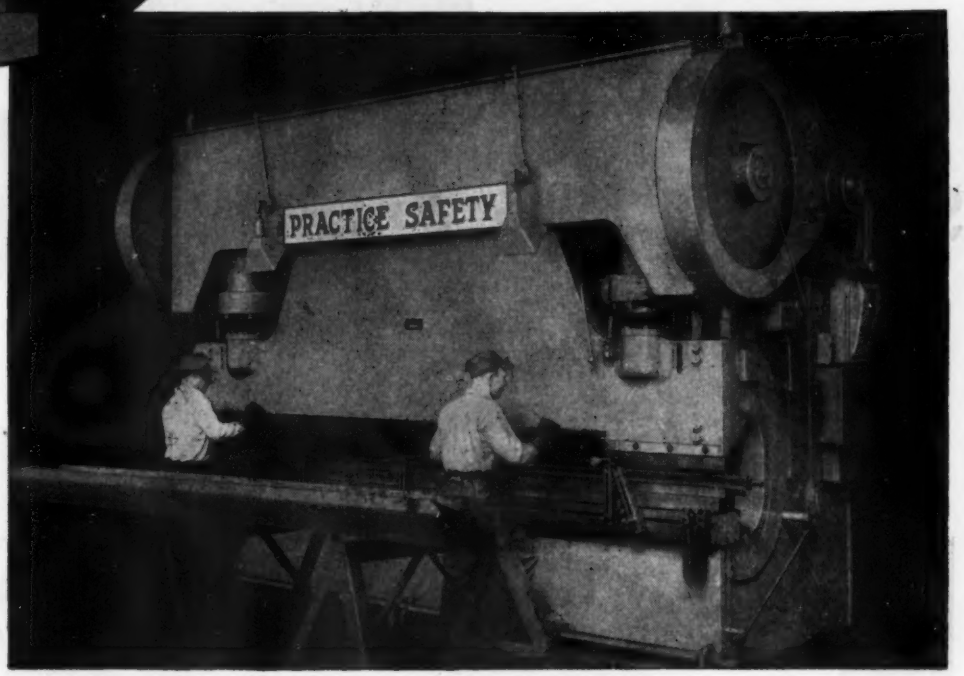
WHITEHEAD & KALES FOR *NEARLY EVERY* FORMING OPERATION

The photographs show the production of parts for car-hauling trailers. Front and back stops make it easy to produce the several bends in each plate accurately and quickly.



This Steelweld handles 12' x 3/8" steel plates between housings and 14' x 5/16" over entire length of bed and ram.

For six years a Model K5-12 Steelweld Press has been in continuous operation at the Whitehead & Kales Co., River Rouge, Mich., for nearly every type of forming operation in steel plate.

Much of the work is on plate 3/8-inch thick and heavier. Bolt holes and larger holes are frequently punched. Recently oval-shaped holes approximately 5 x 7-inch were punched in 1/4-inch plate. Hundreds of special conduit boxes made of 14 gauge steel have been produced to tolerance limits of .005 inch.

New ways of using the machine are continually developed as problems arise. It has proven to be one of the most generally useful all-around tools to The Whitehead & Kales Co., who specialize in automobile-hauling trailers and other structural work.

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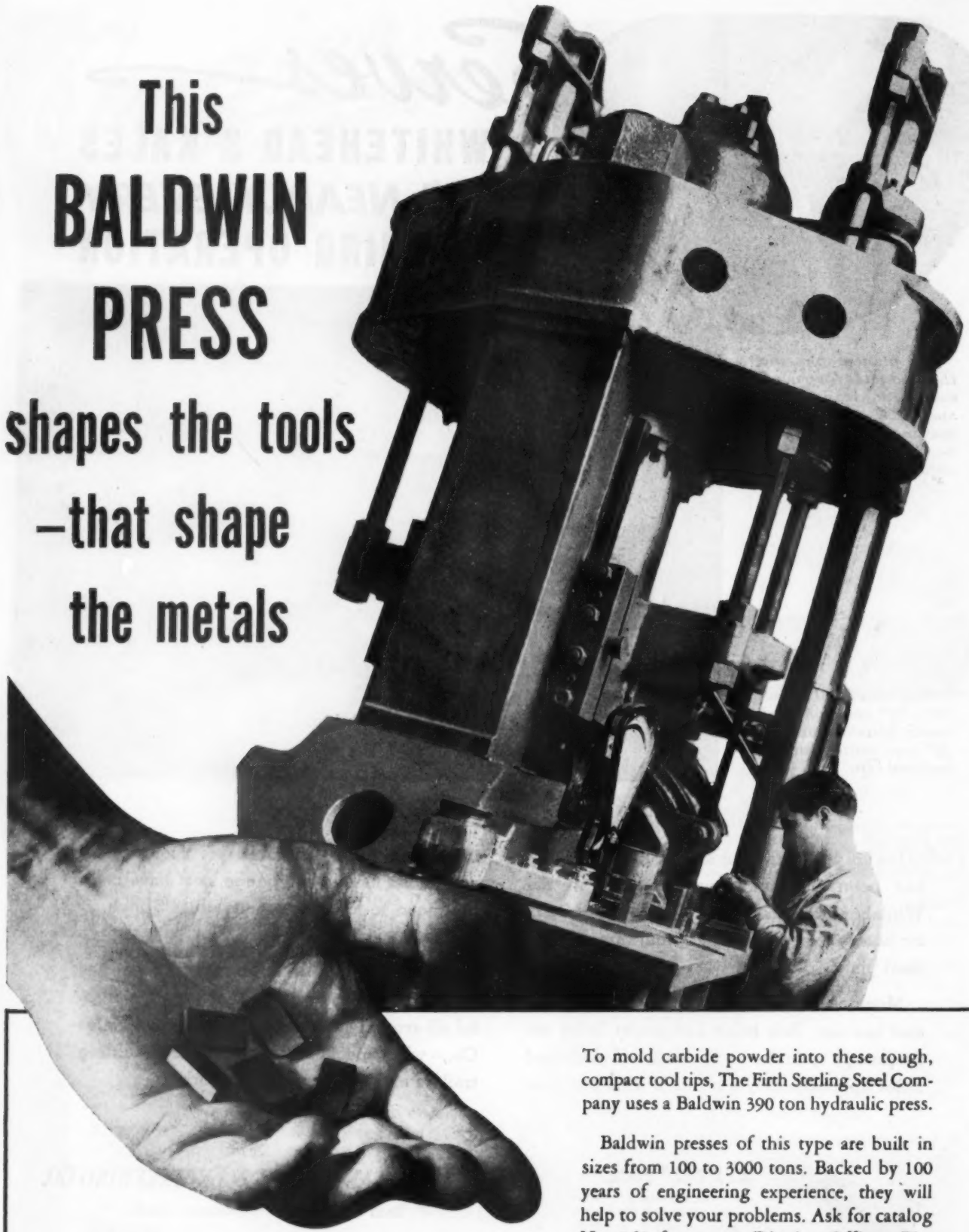
This BALDWIN PRESS shapes the tools –that shape the metals



To mold carbide powder into these tough, compact tool tips, The Firth Sterling Steel Company uses a Baldwin 390 ton hydraulic press.

Baldwin presses of this type are built in sizes from 100 to 3000 tons. Backed by 100 years of engineering experience, they will help to solve your problems. Ask for catalog No. 160 from any District Office. The Baldwin Locomotive Works, Baldwin Southwark Division, Philadelphia, Pa., U. S. A. Offices: Philadelphia, New York, Boston, Chicago, St. Louis, Washington, San Francisco, Detroit, Cleveland, Houston, Pittsburgh.

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You Too SHOULD MAKE WASHERS THE HOVIS WAY!

MAKE WASHERS ON SHORT NOTICE

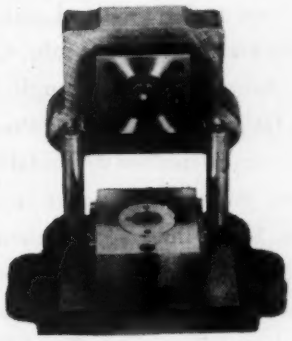
NO LARGE INVENTORIES

THE MASTER DIE DOES NOT BECOME OBSOLETE

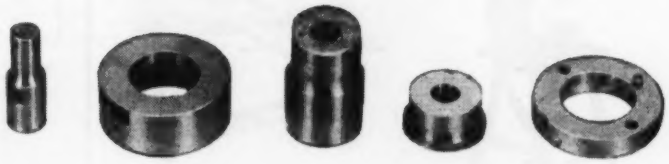
NO NEW DIES TO MAKE

THESE FIVE INTERCHANGEABLE PARTS

Experience before the war and during the war has demonstrated the efficiency of HOVIS UNIVERSAL MASTER WASHER DIES. . . . And now, with the arrival of peacetime production, their use will become even more widespread.



Many Hovis Master Washer Dies have been in continuous use for five years and are still ready to make new size washers.



They are all that you need to change to make a new size, peacetime washer.

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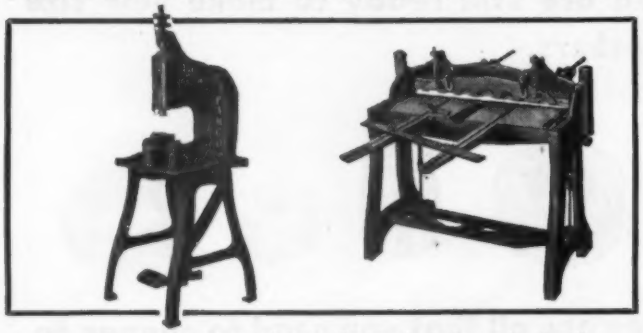

Famco Foot Presses, operated by girls or women, are widely used to step up hundreds of light stamping and forming jobs. Sturdily built in 10 models (bench and floor stand mounting), they require no electric power, need small floor space. First cost and upkeep are low. "Set up" is simple . . . operation is easy.

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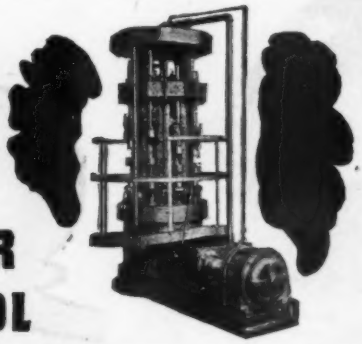

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Efficient tool designing in post war competitive production is a "must". Our experience guarantees you tools—designed for economy of operation, resulting in your increased production at a lower cost.

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BUILDING COMPLETE MACHINE TOOLS
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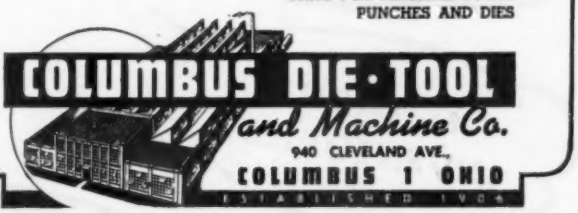

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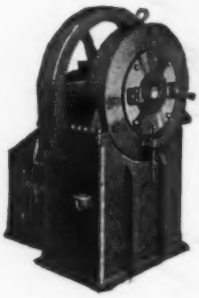

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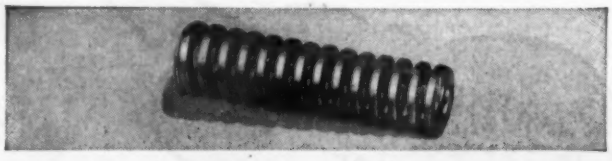

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HIGH PRESSURE MEDIUM DEFLECTION

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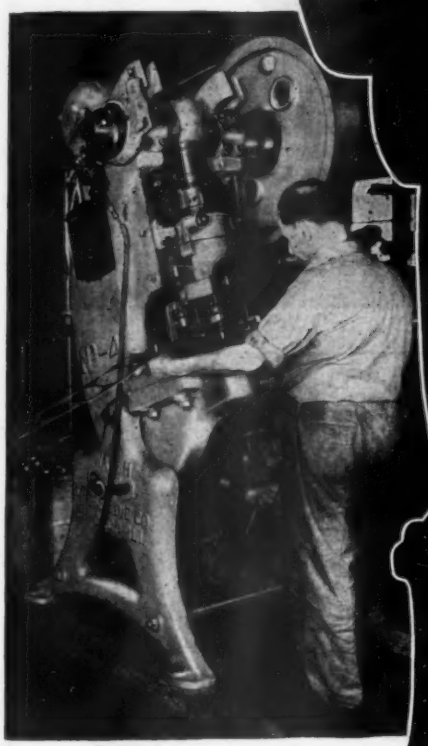

Maximum production at bottom costs because of features based on nearly a half century of engineering and building punch presses.

Stability — heavy-duty semi-steel frames.

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Crankshafts — forged alloy steel, *normalized and ground.*

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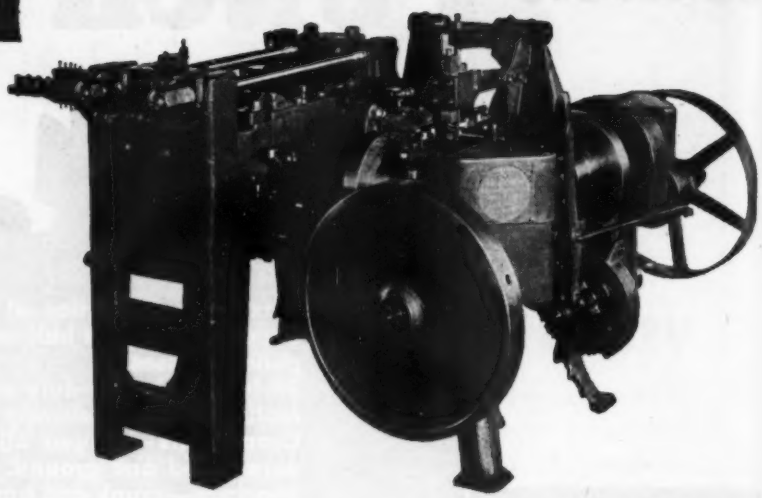
for swaging, stamping, piercing, blanking, forming of coiled metal

These new machines built in two models—for general purpose, heavy duty fabricating metal forming—provides a capacity far beyond what is practical to accomplish with ordinary cam motion. The new NILSON is a combination power press and four slide machine with powerful silent action of main press slide operated by crank motion through toggle or knuckle joints. Great strength and rigidity are inherent in this machine. Die sets are readily accessible and easily removable. No obstruction to view is offered and tools can be adjusted without interference.



These machines are built in 2 sizes—for forming from 3/16" and ¼" diameter wire and for flat material 2" and 2½" wide. Send for 4-page bulletin giving complete details.

As specialists in the design and construction of special automatic machinery of all kinds, we are in position to render a complete service on this class of work. Consult Nilson on your special requirements.

THE A. H. NILSON MACHINE CO... Bridgeport, Conn., U.S.A.

STRAIGHT SIDE SINGLE CRANK PRESSES

for heavy blanking and forming

Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

Full details on request.

straight side press

ZEH & HAHNEMANN CO.
180 Vanderpool Street
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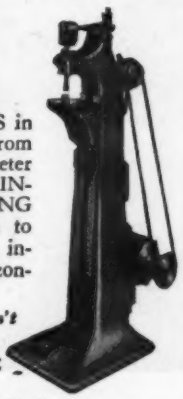
GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to ⅜" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

Metal Stampings "DUPLICATED WITHOUT DIES"

SHEARS

BRAKES

BENDERS

If you desire to save time and critical materials on production of metal stampings or other small parts, then the DI-ACRO System of "Metal Duplicating Without Dies" merits your consideration. It is based on the rapid and accurate production of formed parts with DI-ACRO Shears, Brakes and Benders. All duplicated work is accurate to .001". These precision machines are adaptable to an endless variety of work, and ideally suited for use by girl operators. For short runs your parts are processed in a matter of hours instead of waiting weeks for dies.

Send for this Catalog

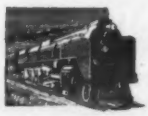
"DIE-LESS DUPLICATING"

It illustrates many stampings or parts made without dies, gives full details on DI-ACRO machines and shows how they may readily be adapted for various applications. Request your copy now.

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING ⟵ Pronounced "DIE-ACK-RO"

O'NEIL-IRWIN MFG. CO. 311 EIGHTH AVENUE SOUTH MINNEAPOLIS 15, MINNESOTA

HE BUILT BACK-SEATS FOR PREDECESSORS



You could have bought a practical steam engine in 1736, the year James Watt was born—yet Watt is known as the father of modern steam power. Although he did not invent the steam engine, James Watt increased its efficiency, power and versatility so much that his engines made it profitable to scrap even the latest models of other types.

A similar picture is presented by the history of presses for the forming of metals. Before Clearing improved design and manufacturing methods, technical restrictions seriously limited press application. By providing faster work cycles, much greater pressures and the ability to work to closer tolerances, modern Clearing Presses became the leaders in their field.

Whatever your production plans, you should investigate how and where Clearing Presses make them more effective. There's every chance that Clearing's recommendations can point the way to lower costs for you as they have already for so many other progressive companies. Write today to CLEARING MACHINE CORPORATION, 6499 West 65th Street, Chicago 38, Illinois.

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MECHANICAL AND HYDRAULIC PRESSES

FOR SUCH OPERATIONS AS DRAWING + BLANKING + FORMING + FORGING

CLEARING ★

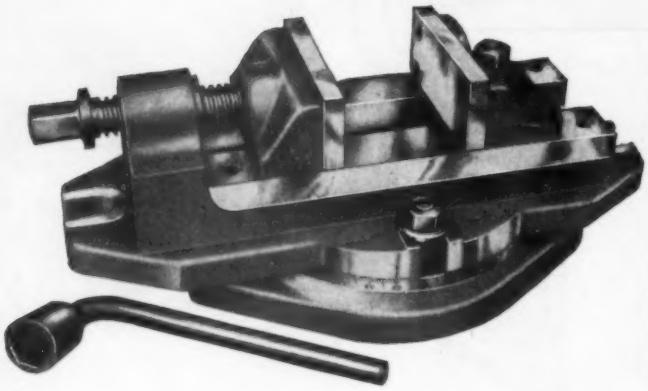
PRODUCTO

MODERN MACHINE VISES

For **EVERY** *use . . .*

EVERY *day . . .*

in **EVERY** *Shop . . .*



General purpose 4½ inch plain and swivel vise, hardened and ground ways.

Producto machine Vises embody all modern refinements in design, construction and material . . . are built not alone for normal shop operations but also to meet the toughest conditions of precise production.

SCREW ACTING VISES,
4½", 6", 9" capacity, Plain and Swivel types.

HARDENED AND GROUND TOOL ROOM VISES,
2 sizes, for finest tool work.

CAM LOCK VISES,
4", 5", 7", for Production Milling and Drilling operations.

SELF-CENTERING SHAFT VISE
for holding shafts or spindles.

QUICK-LOK VISES,
3" and 4" capacity, inexpensive and useful.

Send for bulletins which cover all Producto Vises.

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DETROIT 3017 Medbury
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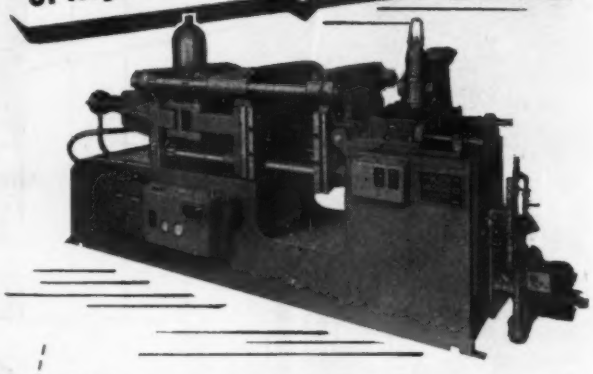
INDIANAPOLIS 139 West 16th Street
LOS ANGELES 2168 E. Olympic Blvd.
NEW YORK, 197 LAFAYETTE STREET

Availability!

KUX Produces the Most Complete Line of High Pressure Die Casting Machines



A size and model for every individual die casting need. 15 different types and sizes. Air operation or self-contained hydraulic operation. Automatic electrically timed casting cycle. Bullet-speed metal injection for densely consolidated castings. Safe, massively strong die plates and toggle mechanism.

WRITE FOR CATALOG OR DEMONSTRATION

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3924-44 West Harrison St.
Chicago 24, Illinois

BAUMBACH STANDARDIZED DIE SETS

BETTER-MADE
DIE SETS
AT LOWER COST
46 Styles—195,000 Sizes
E. A. BAUMBACH MFG. CO.
Machined Steel Semi-Steel
Send for our new catalog
1812 South Kilbourn Ave., Chicago, Ill.

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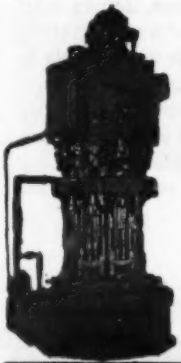
FEEDS
AUTOMATIC EQUIPMENT
The V & O Press Company, Incorporated
HUDSON, NEW YORK



Vertical ROTO-MATICS

Multiple spindle drill heads and automatic clamping provide added production.

DAVIS and THOMPSON Roto-Matic

Continuous operation is essential for maximum production. VERTICAL ROTO-MATICS are continuous operating, multiple spindle, non-indexing machines that are adaptable to a wide range of machine problems. . . . *Bulletins 110 and 120* may help you solve your problems. Write for them.

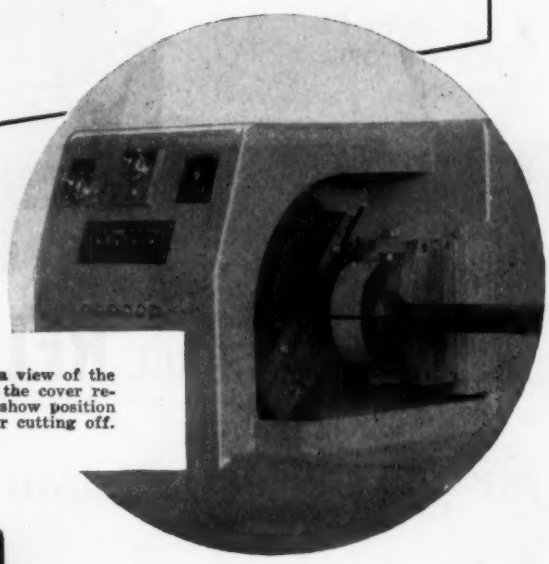
Davis and Thompson Co.
Mfrs. of Machine Tools and Micrometers
6411 W. Burnham St. Milwaukee 14, Wisconsin

The tube remains stationary . . .
it's the cutter head that rotates in the

ETNA Tube Cutoff Machine

Here's a newer, safer, faster way to handle nearly any tube cutoff job! There's no need to straighten tubes to be cut when you handle the job on the Etna Tube . . . a stationary liner holds the tube, thus eliminating scratching or marking. The cutoff cycle—clamping of tube, cutting off and unclamping is accomplished by pushing one control button. An easily adjusted rapid traverse further shortens the operation. Hydraulically operated push button control of the smooth, infinite spindle speeds permits even inexperienced operators to obtain superior results. There are no cams or gears to change.

The ETNA Tube Cutoff Machine is a package unit . . . connect three wires and the unit is ready to work. Drive motor, hydraulic pump and motor, hydraulic cylinders and equipment are mounted within the safe base with the cutter head. The spindle, on which the tool holders are fastened, is mounted on Timken tapered roller bearings, V-belt driven by a Louis-Allis "Adjusto Speed" Motor or a Reliance Adjustable Speed DC Motor. The Etna Cutoff Unit is built in capacities to cut off tube ranging from ½" O.D., ⅛" Wall up to 12" O.D., 1½" Wall. Machines to handle tube of over 5" O.D., 1½" Wall are built to your order.



At right, a view of the unit with the cover removed to show position of tube for cutting off.

Write today! Get full details on the ETNA Tube Cutoff Machine! Complete operating and construction data will be sent at your request.

The **ETNA** *Machine Co.*

"Ask ETNA about Swaging"

TOLEDO 10, OHIO

New Design—Available for *Prompt Delivery*

1 CLUTCHING—Hydraulic

2 DE-CLUTCHING—Hydraulic

3 CONTROLS for INCLINING—Hydraulic

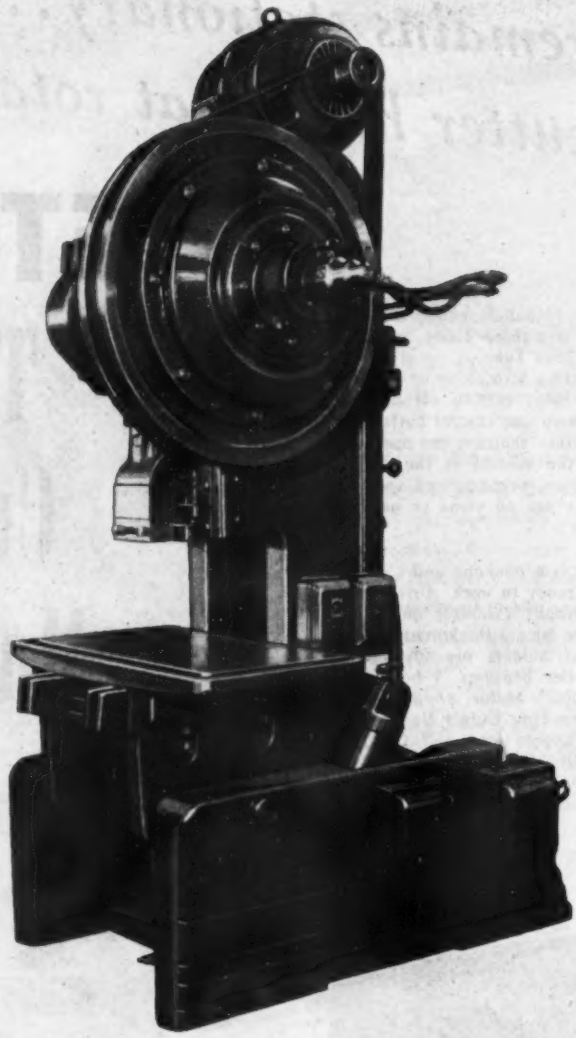
4 CONTROLS for BRAKE ACTION—Hydraulic

5 CONTROL for POSITIVE STOP—Hydraulic

6 STROKES PER MINUTE—160

7 FASTER INTERMITTENT OPERATION

8 FLYWHEEL BEARINGS—Timken



9 OPERATION—Extremely Quiet

10 STROKE—Single, Safety Non-Repeating or Continuous Operation

11 MORE PIECES PER HOUR

12 LESS EFFORT TO OPERATE

13 ACCURATE ON LONG RUNS

14 SIMPLE

15 SAFE

16 ALL ADJUSTMENTS EASILY MADE

HYDRAULIC CONTROL RELIANCE HIGH SPEED PUNCH PRESS

for greater production

better work—lower costs

•

Capacity 40-50 tons

Developed specifically to modernize and speed up operations, this NEW machine has already proved the means of revolutionizing hitherto accepted ideas of punch press performance.

Hydraulic control is built *into* the machine, not merely *added* to a standard design. Controls are interlocked for safety and speed in handling. All adjustments are conveniently and easily made because they are *designed* for accessibility.

A quick study of the specifications and features of the NEW RELIANCE HYDRAULIC CONTROL INCLINABLE PRESS will disclose the remarkable progress represented in this machine and why its performance in actual service is phenomenal.

Write today for further details.

RELIANCE HYDRAULIC PRESS INC.

405 LEXINGTON AVE. NEW YORK 17, N. Y.

Avey FEATURE No. 3

THE Avey TYPE MA-6
AVEY-MATIC POWER FEED HAND FEED AND REVERSING MOTOR TAPPING MACHINE

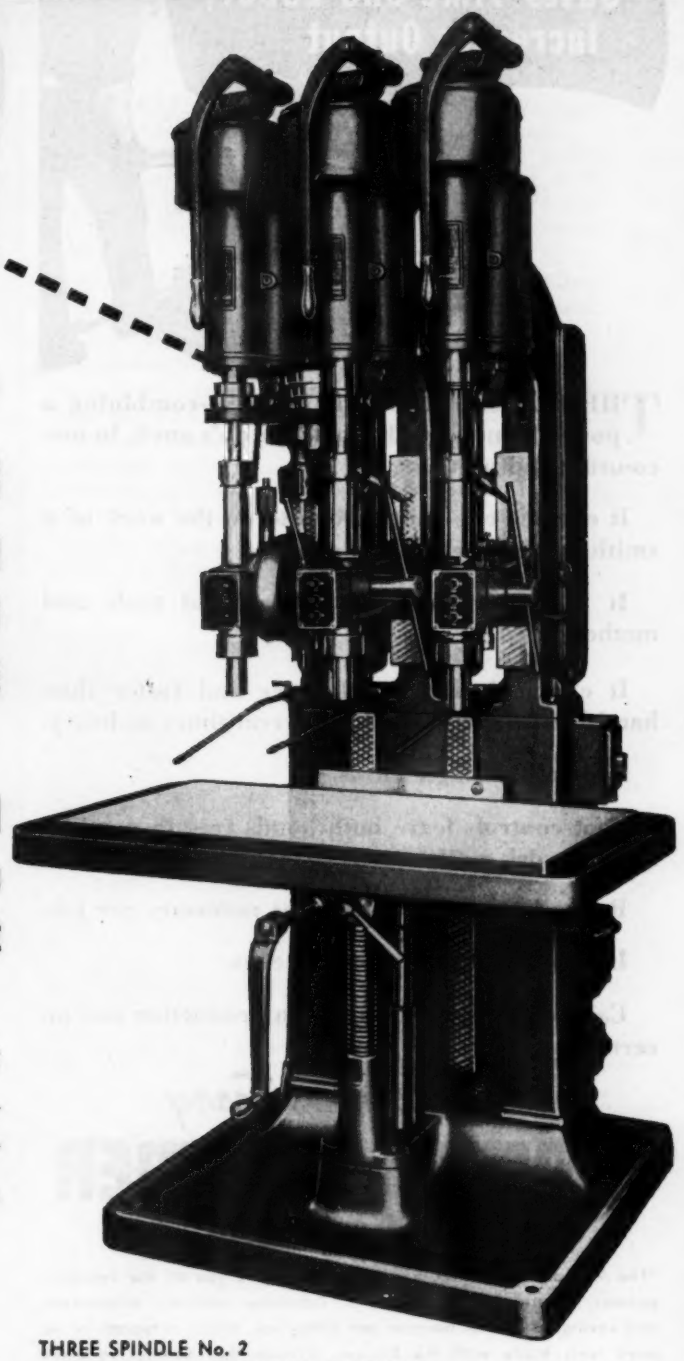
features

reversing motor, positive lead screw tapping — for accurate thread and tapping in soft material or thin sheets

Dog control for depth — maintaining accuracy of depth within one-half revolution of the spindle — or emergency relief lever used to reverse motor if necessary before tapping cycle is completed.

Type MA-6 is made in following capacities:
No. 2 — 7/8" capacity in cast iron.
No. 3 — 1 1/4" capacity in cast iron.

THE AVEY DRILLING MACHINE CO.
CINCINNATI • OHIO • U. S. A.



THREE SPINDLE No. 2
TYPE MA-6 • COMBINATION MACHINE
1st Spindle - Avey-matic Feed
2nd Spindle - Hand Feed
3rd Spindle - Tapping (Reversing Motor)

ARMY E NAVY

Avey

This Mechanical
"BLACKSMITH'S HELPER"
Saves Time and Labor,
Increases Output

THE Blacker Hammer is unique—combining a power hammer with a blacksmith's anvil, in one co-ordinated unit.

It enables one smith alone to do the work of a smith and two helpers.

It uses the smith's familiar hand tools and methods.

It can deliver blows heavier and faster than hand blows—average blow several times as heavy.

Can deliver single blows.

Foot controls leave both hands free to manipulate the work on the anvil.

Reduces the number of heats necessary per job.

Has no belts, pulleys or clutches.

Capable of use as a repetition production tool on certain types of operation.

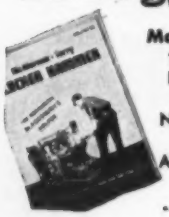
McKiernan-Terry

BLACKER HAMMER

GET THIS NEW BULLETIN

"The Mechanical Blacksmith's Helper" will give you all the details—pictures, description, cross-sections. Tabulates concisely advantages and savings a Blacker Hammer can bring you. Shows a typical set of anvil tools made with the Blacker. A book that belongs in every Blacksmith shop. Send for it and find out how a Blacker Hammer can speed operations for you and cut operating costs. Free—just mail the coupon.

— — — — *Sign and Send Now* — — — —



McKiernan-Terry Corp.,
18 Park Row, New York 7, N. Y.
Please send me Blacker Hammer Bulletin No. 56.

Name.....

Address.....

.....

SAVES $82.50 to $110 A MONTH

Carefully checking cutting oil savings made with their AMERICAN Chip Wringer over a 12-month period, the production manager for a Chicago manufacturer* reports:

(1) Savings in cutting oil of 3 to 4 drums every month. At $27.50 a drum, that's a saving of $82.50 to $110!

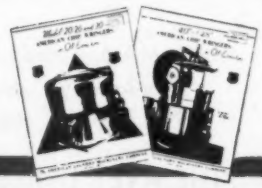
(2) Savings in man hours since using their AMERICAN Chip Wringer to dry small screw machine parts in their plating department.

(3) Increased scrap value of chips.

(4) The extractor (representing an investment of approximately $1200, including electric hoist) had "more than paid for itself" . . . "is just as important to our successful operation as any tool in the plant."

In less than 3 minutes, an AMERICAN Chip Wringer reclaims 90% of the cutting oil from a load of metal chips or machine turnings. Any unskilled person can operate it. Let us show you how much *your* plant will save per month with an AMERICAN Chip Wringer. Write today! No obligation.

*Name on request.



ILLUSTRATED BOOKLETS FREE ON REQUEST
Send for these catalogs describing five different models of AMERICAN Chip Wringer.

ARMY NAVY E CINCINNATI PLANT

THE AMERICAN LAUNDRY MACHINERY CO.

The AMERICAN LAUNDRY MACHINERY COMPANY
CINCINNATI 12, OHIO

THERE'S NO NEED TO "OVER-REACH" IN OPERATING THIS MACHINE

The BAKER unit shown below . . . a standard BAKER 65-HH hydraulic feed floor type unit . . . was furnished to a well-known automotive manufacturer for multiple drilling main bearing caps. BAKER Engineers worked out a special arrangement for the job, including such special features as these:

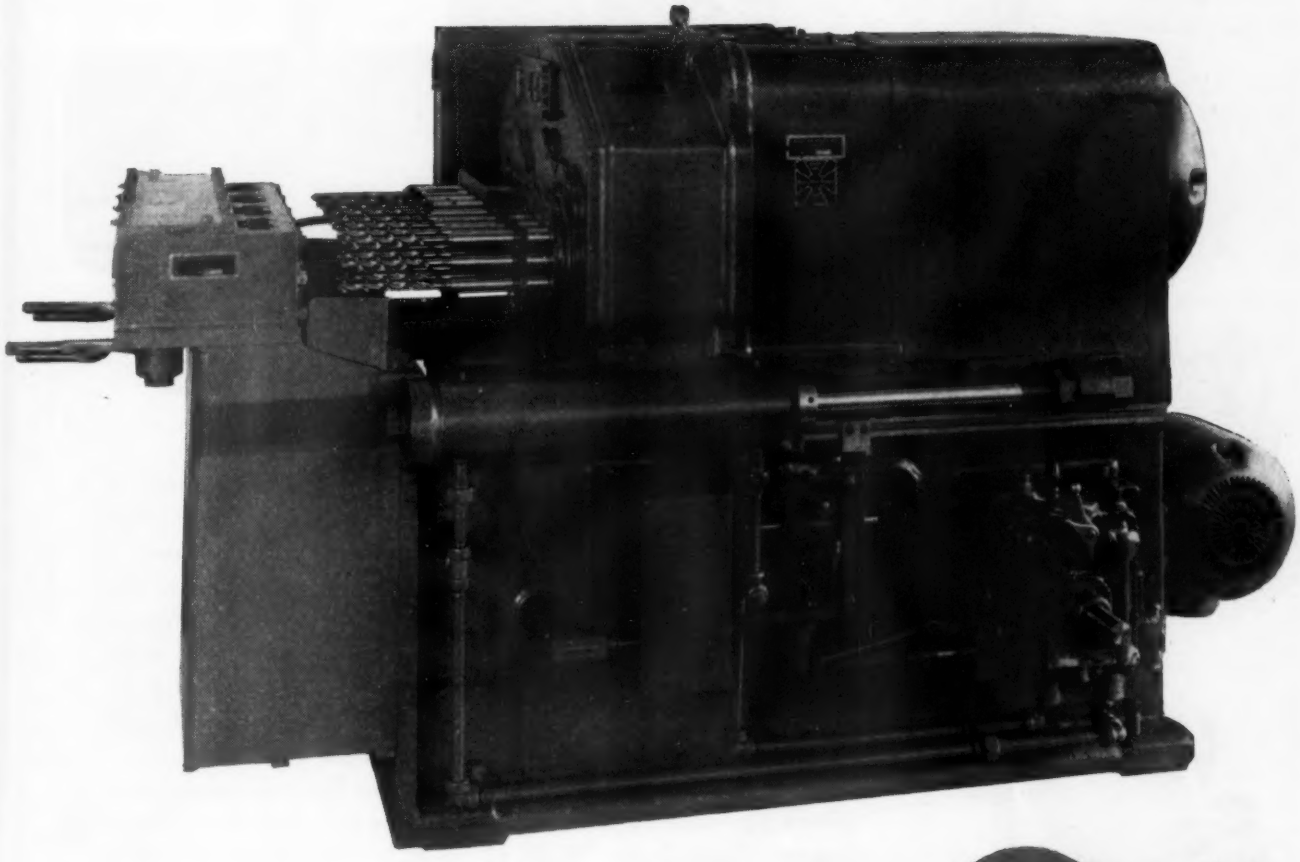
Heavy-duty fixed center sixteen-spindle multiple head with simplified direct drive from main drive motor.

Special quick-acting work-holding fixture.

Unique arrangement of controls permits operator to load, operate and unload machine from one position.

Automatic cycle of rapid traverse, automatic engagement into feed, automatic trip at adjusted depth and return of complete head to rear position.

BAKER engineering consultant service is available to help solve *your* special problems, too. Write.



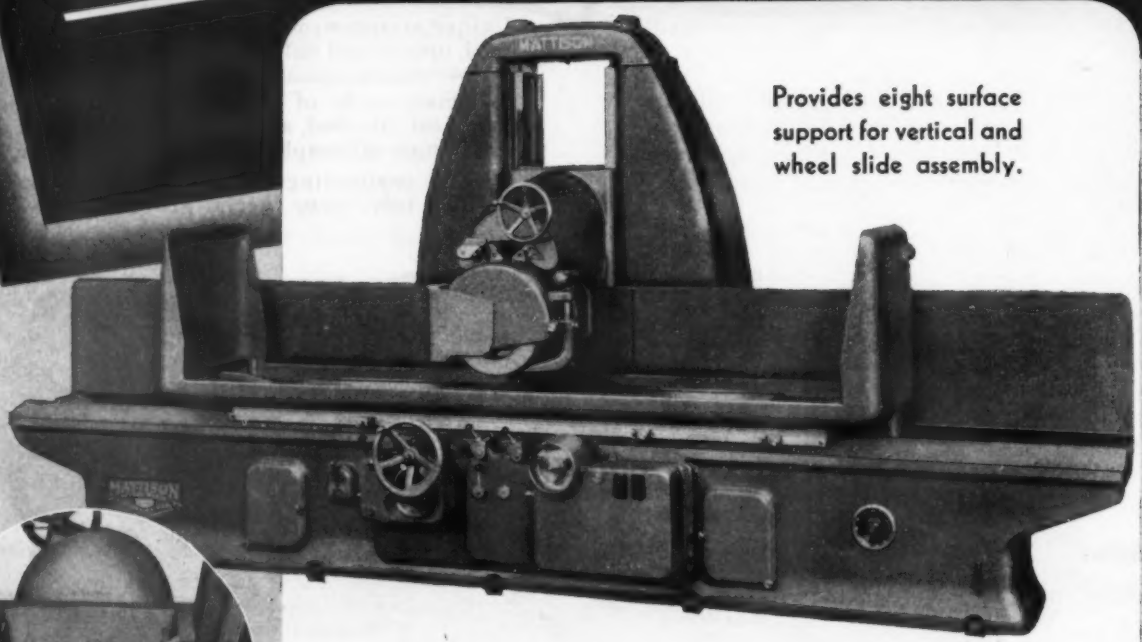
BAKER Bros., Inc.

Single and Multiple Spindle Machines for Drilling, Boring and Tapping **TOLEDO 10, OHIO**

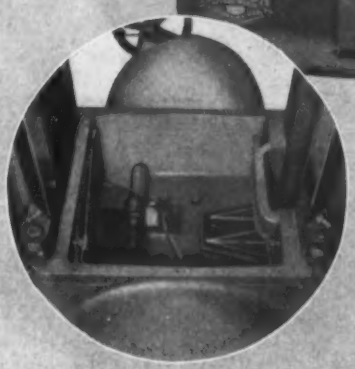
MATTISON

HIGH-POWERED PRECISION SURFACE GRINDER

Not One Column... But Two



Provides eight surface support for vertical and wheel slide assembly.



AN outstanding characteristic of the Mattison Surface Grinder is the massive double column support for wheel slide assembly. The housing in which the grinding wheel and its motor are mounted is exceptionally heavy and is carried on large horizontal ways of the vertical slide. This assembly is in turn supported between two heavy cast columns. Wide bearing surfaces on the inside face of each column and dovetail bearing surfaces on the front and back of each column provide an eight surface support, eliminating side rock and insuring stability regardless of direction of table travel.

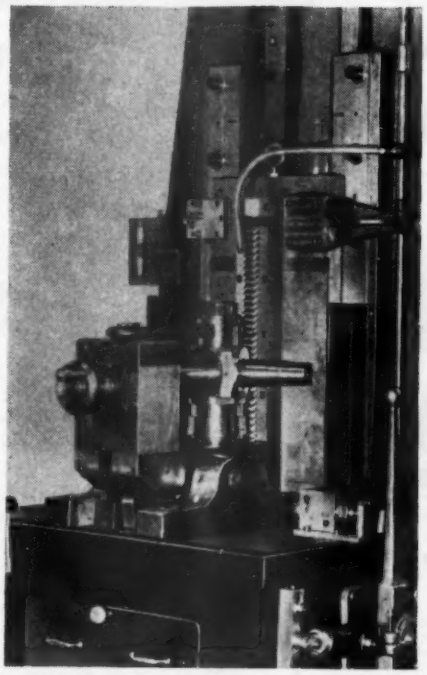
Lower costs, speedier production and a fine finish are advantages gained by installing a Mattison High-Powered Precision Surface Grinder. Table Sizes: Width 12" to 36" — Length 36" to 192". Write for free circular and set-up book giving further information.

MATTISON MACHINE WORKS—ROCKFORD, ILLINOIS

• IF YOU PLAN FOR TOMORROW • • CONSULT LAPOINTE TODAY •

IT CAN'T BE DONE—

...but they did it!



Surface broaching the contour on a three bladed propeller hub. This operation requires a special spiral type fixture.

JET PROPULSION . . . as old as yesterday, as new as tomorrow — was made by superior engineering knowledge . . . yes, and by broaching, too. No other method of metal removing gives so much production with such precision as does broaching.

From the drawing boards to the stratosphere was a shorter hop because Lapointe engineers assisted in machine problems, pointing out savings in time, labor and space — information of vital importance to tomorrow's small and large plane manufacturers. You will find it practical and timely to investigate broaching. Ask Lapointe for analysis of both your product and your plan.

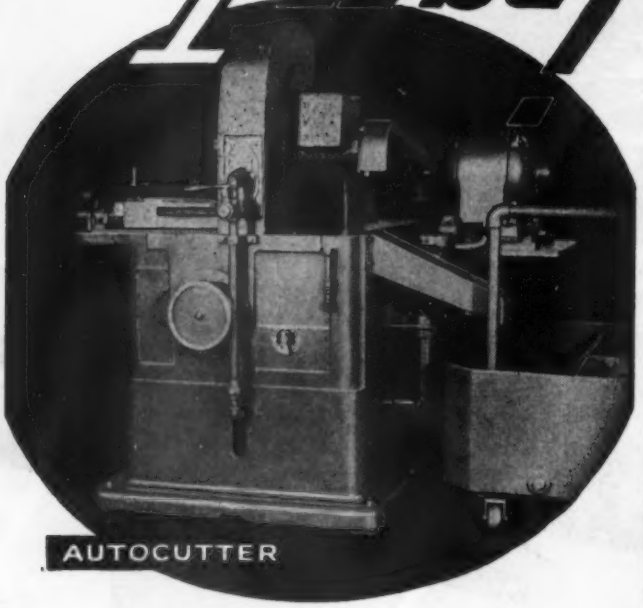
THE Lapointe

MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

IT'S A First



Yes, this CAMPBELL "MODEL 700" is the first *fully automatic* abrasive cutting machine ever built. Coming from CAMPBELL, manufacturers of the most complete range of abrasive cutters, that's big news.

This "700" is "first" another way. It is the opening announcement of CAMPBELL'S post-war program of development, based on wartime improvements all through the line. Other announcements will follow.

Maybe there's a way a CAMPBELL ABRASIVE CUTTER could speed up or economize your production. It's easy to find out.

WHY NOT DO THIS?

Write and tell us (1) the range of sizes, (2) kind of material, (3) length of cutoff pieces, (4) length of stock before cutting, (5) tolerance for length of cut pieces and (6) hourly production requirement. With this information, CAMPBELL engineers can recommend production procedure and work up cost sheets for you.

Campbell

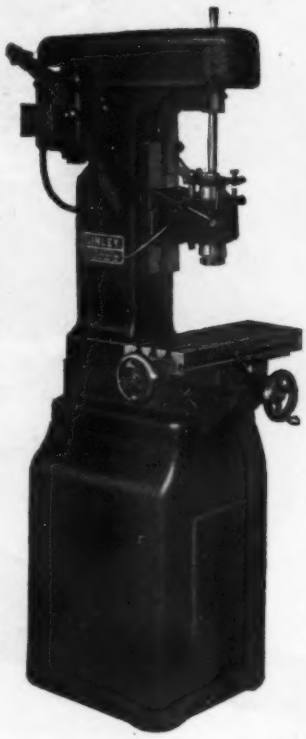
ABRASIVE CUTTING MACHINES

ANDREW C. CAMPBELL DIVISION
BRIDGEPORT • CONNECTICUT

ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

ACCO AMERICAN CHAIN & CABLE COMPANY, Inc.

Help Your Toolmakers



SPEED WORK . . . CUT COSTS

Mechanical equipment that saves time is a valuable asset in gaining competitive advantage in new production. The LINLEY Milling and Jig Boring Machine does just that . . . by enabling toolmakers to turn out more small dies, jigs, metal patterns, models, etc., in a busy day.

FEATURES INCLUDE: 8 spindle speeds to 4250 r.p.m.; quick set-up, easy changeover; grease-sealed bearings; direct micrometer setting; 7" x 17½" table size; 18½" x 20" floor space.

This compact, sturdy machine will earn generous profits, pay for itself quickly, prevent tie-ups of higher rated equipment.

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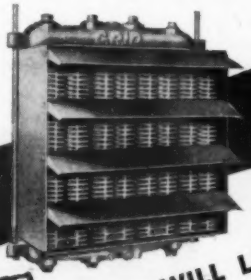
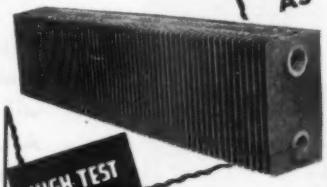
LINLEY BROTHERS COMPANY
664 STATE ST. EXTENSION
BRIDGEPORT 1, CONN.

INSTALL GRID UNIT HEATERS



THAT WILL LAST AS LONG AS THE PIPES FURNISHING STEAM TO THEM—



HERE'S WHY

HIGH TEST Cast Iron HEATING SECTIONS

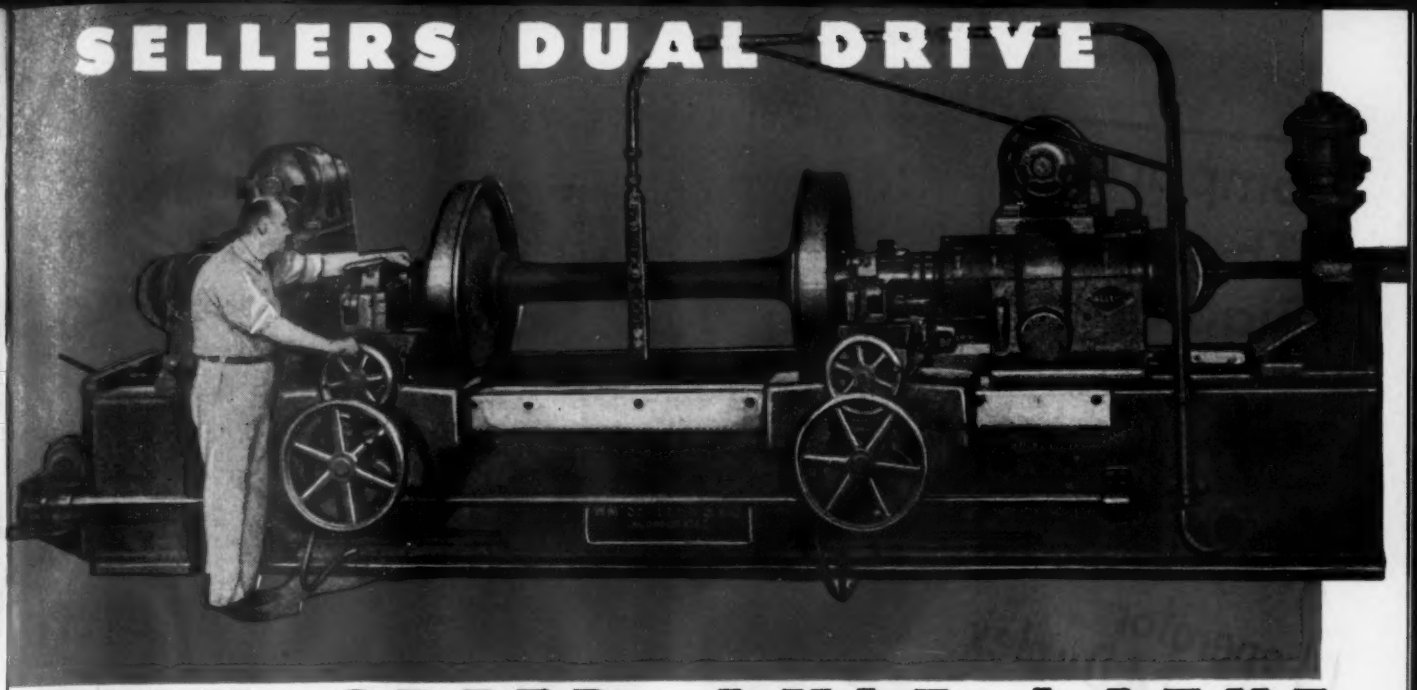
- One piece construction heating sections (patented) of high test cast iron that withstand steam pressure up to 250 lbs.
- No soldered, brazed, welded or expanded connections to become loose or develop leaks.
- No electrolysis to cause corrosion, breakdowns, leaks, or heating failures. GRID Unit Heaters are built to last, as is proven by the many plants that have operated them continuously—some as long as 15 years, without maintenance. Complete data and capacity tables upon request.

SEND

New booklet "Corrosion in Unit Heaters" that tells you why cast iron withstands corrosive atmospheres—yours upon request.

GRID D. J. MURRAY MANUFACTURING CO.
WAUSAU • WISCONSIN

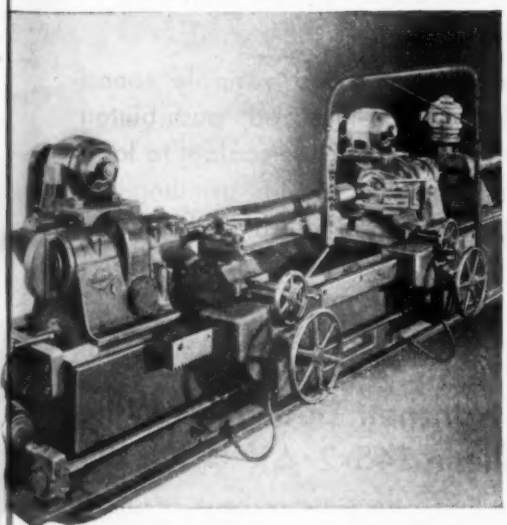
SELLERS DUAL DRIVE



HIGH SPEED AXLE LATHE

FOR TURNING, TRUING AND BURNISHING ALL TYPES OF LOOSE AND MOUNTED AXLES . . . This Ultra-Modern axle lathe is designed to meet production demands and accuracy standards by the use of carbide tooling. It's a heavy, rugged machine for turning inside and outside journals on mounted wheel sets, also journals and wheel seats on loose axles.

ARMY E NAVY



FEATURES

1. Dual end drive with friction plates against each end of axle.
2. Drive is by dual motors through worms and worm wheels.
3. Maximum speed up to 200 revolutions per minute for carbide tools.
4. Generating tool holder for turning true fillets without chatter.
5. Complete anti-friction drive running in oil.
6. Carriages have rack feed, protected by slip clutch designed for continuous rolling operation.
7. Finger-tip feed selection in either direction by electronic control.
8. Centers are safety locked by power.
9. Hardened wear plates on bed.
10. Solid bed continuous way construction—arranged for coolant system.

For complete information write—

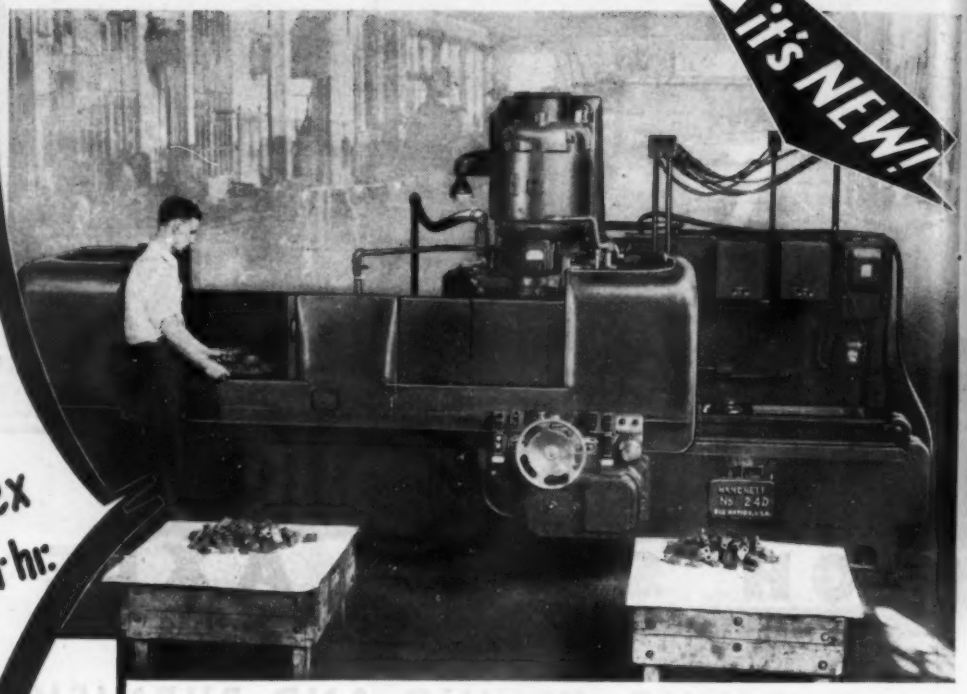
WILLIAM SELLERS & COMPANY, INC.
PHILADELPHIA PENNSYLVANIA

SELLERS PRECISION TOOLS SINCE 1848

Compare These Figures:

~~1 operator~~
~~1 standard grinder~~
~~250 pieces per hr.~~

1 operator
1 No. 24-Duplex
500 pieces per hr.



The Job — Inserted tooth cutters. Must be ground very accurately for parallellism and size. Exceptionally fine finish. Wheel feed light to prevent heating and checking — grinding time relatively long. Chuck cleaned and loaded carefully to maintain accuracy limits. 125 pieces to a chuck. Grinding time — 15 min. Loading time — about the same.

Previous Method — Ground on single-table surface grinder. Machine *idle 30 min. of every hour,* while operator unloaded, cleaned and reloaded chuck. Production — 250 pieces per hour.

24-Duplex Method — Ground on No. 24-Duplex two-table grinder. While second load is being ground, operator unloads, cleans and reloads first chuck — No. 24-Duplex actually grinds more than 90% of the time. Production — 500 pieces per hour.

-That's PRODUCTION GRINDING on The New HANCHETT No.24-Duplex!

Here's a practical solution to your problem of high production grinding with limited manpower. The No. 24-Duplex actually doubles output per hour—yet it requires only one operator! And the only downtime is the few seconds needed to switch from one load to the other. Productive grinding time, therefore, is more than 90% of every hour.

Added Features: Electronic-controlled variable speed unit for each rotary table . . . centralized, push-button controls . . . tilting splash guard (confines coolant to load being ground.) If you encounter a similar grinding job —where loading and grinding time are about the same—you'll want to know more about this modern, precision machine:

See Your Nearest Hanchett Dealer, or Write for Bulletin 145-2 AK

HANCHETT HERMETI-COIL MAGNETIC CHUCKS

HANCHETT GRINDERS — BIG RAPIDS MICHIGAN

IF IT'S A FLAT SURFACE—THERE'S A HANCHETT TO GRIND IT

HANCHETT MANUFACTURING CO.
BIG RAPIDS, MICHIGAN U.S.A.

GORTON

Tracer-Controlled MILLING

Tracer Control SAVED 120 HOURS Duplicating Eight (8) Die Molds for *Plastics*

8 Dies Duplicated from 1 Original Master

ON THIS TYPICAL JOB that previously took 40 hours per die—the Gorton Duplicator gave this manufacturer a Tracer-Controlled machining method that saved 15 hours' actual machining time per die in the production of 8 die molds for plastic handles. Simplicity of setups and Gorton improved finish which eliminated any hand finishing operations brought additional savings.

You will find the Gorton 8½-D Duplicator the ideal machine tool for all kinds of die and mold work, capable of duplicating any part accurately with extremely fine finish. On many war jobs today, Gorton Duplicators are paying for themselves in savings effected.

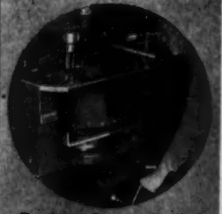
PRODUCTION DATA

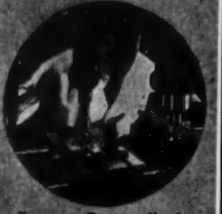
Material—Machine Steel.
Operation—Duplicating Die Molds for Plastic Handles.
Speed—Roughing, 500 r.p.m.
Finishing, 1100 r.p.m.
Time—25 Hours per Mold, Floor-to-Floor.
Holding Method—Simple Table Vise.
Accuracy—.001" with Extra Fine Finish.
Savings with Tracer Control—15 Hours per Die—Total Savings—120 Hours per 8 Dies.

FREE ENGINEERING SERVICE

There is a "Tracer-Control" solution to your machining problem. Submit it to Gorton engineers who have had more than 50 years of practical experience in the development of Tracer-Controlled Milling. Call on your nearest Gorton Dealer, or write to the Gorton factory at Racine, Wisconsin.

The *Right* Size The *Right* Type of Machine for Every Job . . .
From 2 oz. to 2 Ton


DIE BLOCKS


Tracer-Controlled MILLING

Tracer-Controlled DUPLICATING

Tracer-Controlled ENGRAVING

Tracer-Controlled ETCHING

GORTON *Precision* MACHINES

CUTTER GRINDERS
ETCHING MACHINES
5 & 3 Dimensional PANTOGRAPHS
Vertical & Horizontal Head Super-Speed MILLERS
Manual & Electric Control DUPLICATORS

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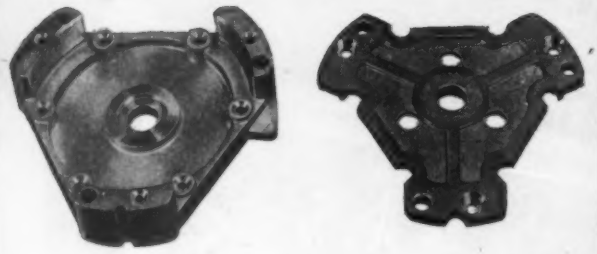
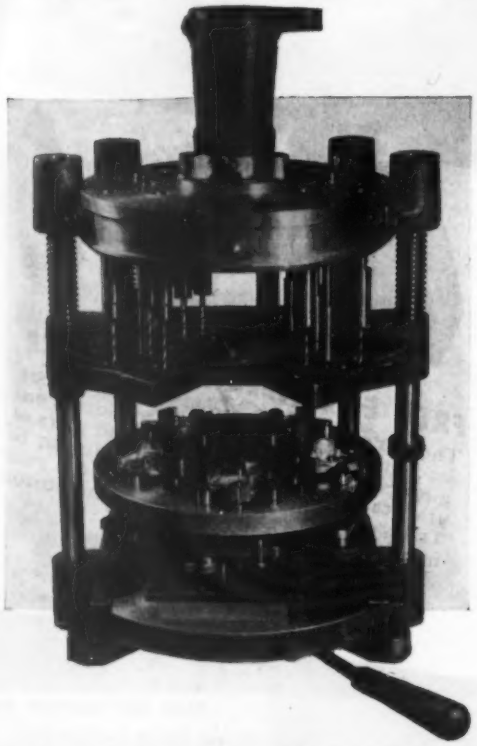
Name..... *Title*.....
Company.....
Address.....
City..... *State*.....

A sure way to speed up small parts drilling and tapping



A sample of Ettco-Emrick results

60 high-precision operations were called for on this die-cast aluminum body and cover—18 drilling, 27 countersinking, 3 counterboring and 12 tapping. With four Multiple Heads engineered and supplied by us, all 60 operations are done in 90 seconds. Below is one of the Heads with its indexing fixture all ready to put on the drill press.



Whether a part has 2 holes or many, we can tool you up with Ettco-Emrick Multiple Spindle Heads to give you any drilling or tapping production you need.

The reason is that these Heads are more than just tools for drilling or tapping a number of holes at a time. Each head is engineered for a particular part to make possible the *fastest handling* of the part and the drilling or tapping of the *maximum* number of holes at every stroke of the press.

We can give you these results on a wide range of small parts, because the Ettco-Emrick System includes a dozen different work handling devices like the indexing fixture on the Head illustrated. They reduce the operator's work to loading parts and working the press. All locating, clamping and releasing is automatic.

Initial cost is low because Ettco-Emrick Multiple Heads are made of standard parts and handling fixtures are all standardized. And this is a temporary outlay, for it is paid back in quick time by savings in man-hours and machine hours.

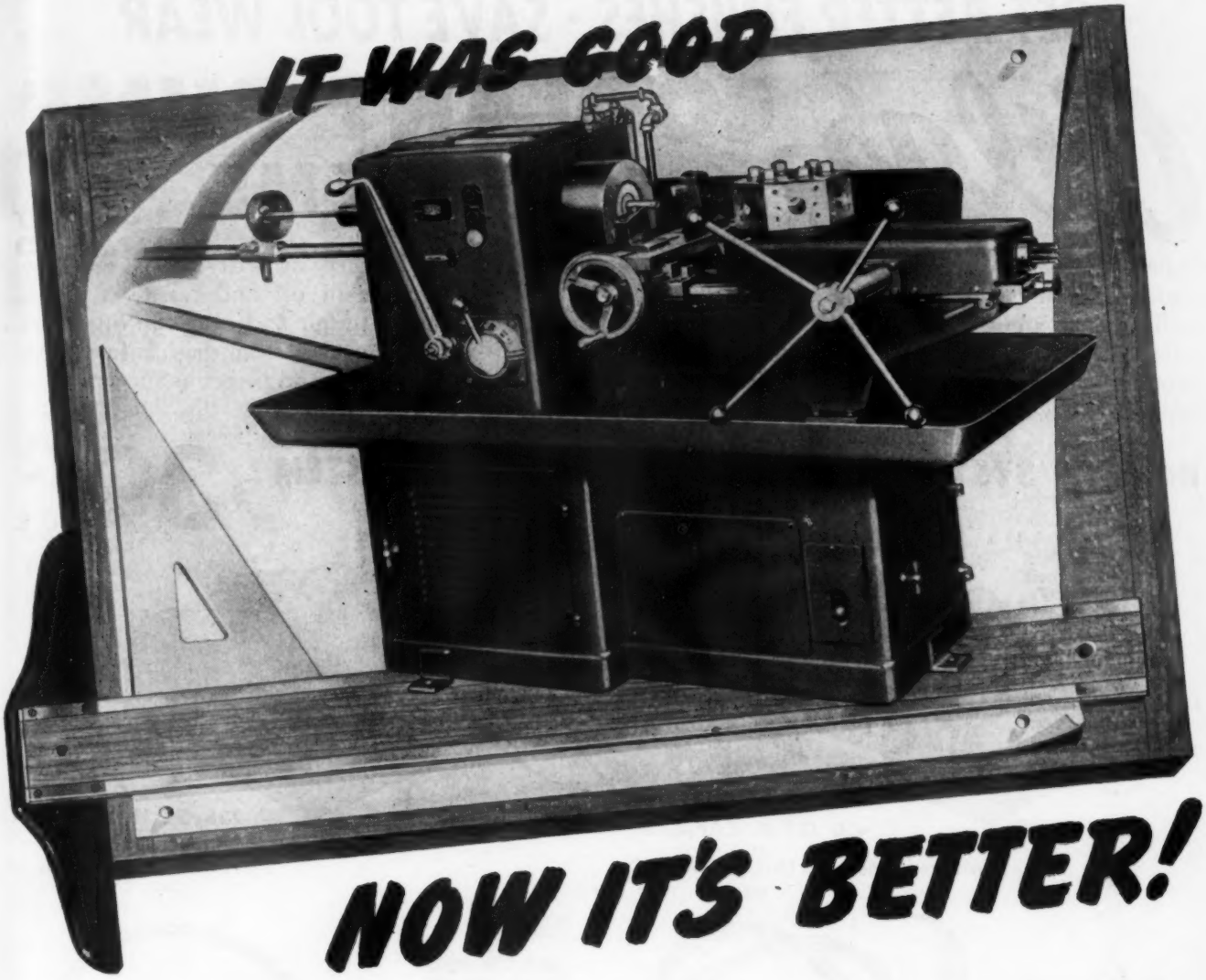
FOR RECOMMENDATIONS on any particular small part, send us a sample or drawing with required production figures. We've engineered hundreds of such jobs and know the answers on small parts drilling and tapping.

For more examples of Ettco-Emrick results WRITE for the "Multiple Head reprints"

ETTCO TOOL CO.

590 Johnson Ave., Brooklyn 6, N. Y.
Detroit 1 • Chicago 6

Over 25 years specialization in solving Industry's drilling and tapping problems



NOW IT'S BETTER!

Again, the Oster *SIMPLIFIED* No. 601 "RAPIDUCTION" lathe steps ahead with these additional developments:

1. New 4-speed motor permits four speed changes without change of sheaves. (2-speed motor optional.)

2. Motor is mounted on oil-resistant rubber to insure smooth, quiet operation.

3. Individual ⅛ H. P. motor now operates coolant pump to provide uniform flow of lubricant, independent of spindle speeds.

4. New electrical controls have speed selector switch located conveniently for the operator.

5. Increased rigidity of the machine is insured with longer base of heavier construction.

★ ★ ★

The Oster No. 601 "RAPIDUCTION" lathe is equipped with either WORM drive or DIRECT drive, as required. Other options include automatically indexed six-position turret or plain saddle. Capacity of machine: 1½" round bar. Ask your nearest Oster dealer or write us for complete details.

Inquiries are invited but deliveries are uncertain due to conditions beyond our control.

OSTER

"Rapiduction" LATHES

THE OSTER MANUFACTURING COMPANY • 2049 EAST 61ST STREET, CLEVELAND 3, OHIO, U. S. A.

GET BETTER FINISHES • SAVE TOOL WEAR

Atlas COOLANT PUMP SYSTEMS

Quickly and easily attached to any type machine tool — lathes, screw machines, drill presses, milling machines, cut-off tools and saws — Atlas coolant systems can help you speed up production and reduce tool-wear. New design centrifugal type pump has no gears to wear — is not affected by dirty or gritty fluids. Feed and return lines made of oil and caustic resistant extruded plastic, tough and non-kinking. Flow control valve adjustable from drip to fast washing stream. Two sizes and prices as shown below ready for quick delivery.

No. W89 SYSTEM $49.75 F.O.B.

5 GAL. TANK
450 G.P.H. CAPACITY
Universal Motor 110-120V AC-DC
6000 RPM

No. W88 SYSTEM $39.75 F.O.B.

2½ GAL. TANK
225 G.P.H. CAPACITY
INDUCTION MOTOR
110-120V AC-DC 50-60 Cycle AC
3450 RPM

STANDARD EQUIPMENT INCLUDES:

VALVE TO CONTROL FLOW FROM DRIP TO FAST WASH

NOZZLE and FLEXIBLE METAL TUBE

SELECT CLAMPING DEVICE YOU NEED AND SPECIFY IT BY NUMBER

No. W-97
HAS EXTRA LENGTH FEED AND FLAT BRACKET

OR

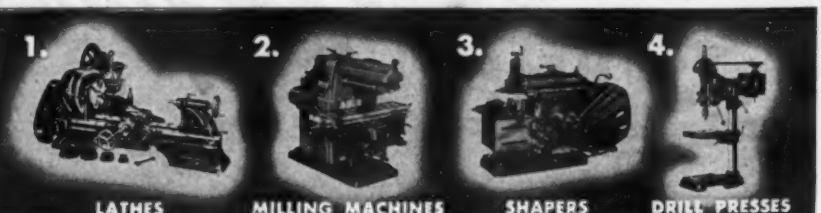
No. W-96
HAS FLAT-TYPE BRACKET FOR BENCH LATHES ALSO ADAPTABLE FOR OTHER TOOLS

OR

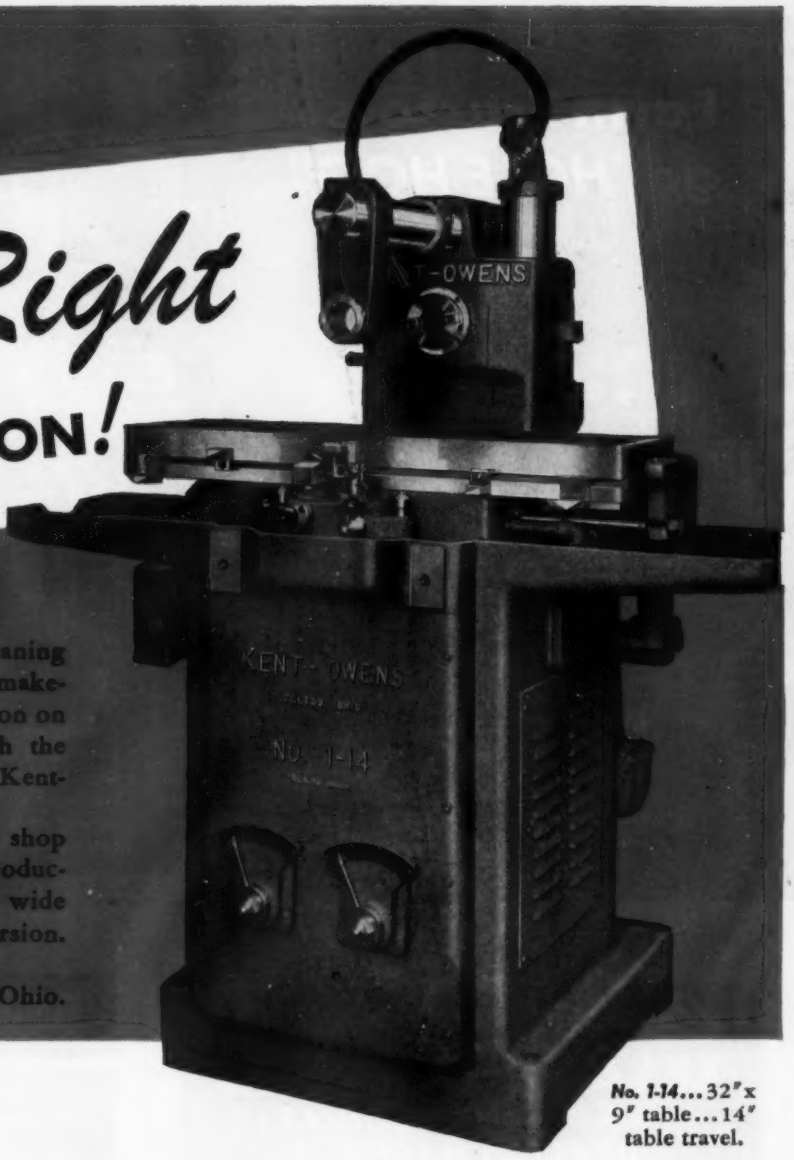
No. W-98
COLLAR CLAMP FOR DRILL PRESSES AND OTHER ROUND OR IRREGULAR SURFACES

Order from your Atlas distributor. Specify clamping device by number. Coolant systems also available for multiple spindle drill presses. Send for descriptive literature and prices. Atlas Press Company, 1104 No. Pitcher St. Kalamazoo, Mich.

4 Atlas TOOL TEAM FOR SMALL-PARTS MACHINING



Start Right IN RECONVERSION!



Change-over time is the ideal house-cleaning time to get rid of worn-out, inadequate or make-shift machines! In swinging into production on new civilian products . . . *start right* with the *accuracy* and *cost-cutting dependability* of Kent-Owens Milling Machines!

These are the machines preferred by shop men for speedy, practical and efficient production. Rugged . . . simple . . . adaptable to a wide range of work for the job ahead in reconversion. Write for latest bulletins.

Kent-Owens Machine Company, Toledo, Ohio.

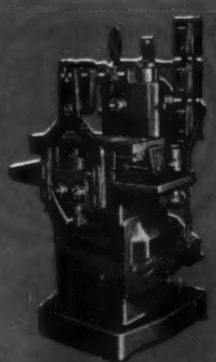
No. 1-14 . . . 32" x 9" table . . . 14" table travel.

Specify

KENT-OWENS

Milling Machines

No. 1-V . . . Hydraulic vertical head feed . . . 5½" head travel . . . 25" x 9" table.



No. 1-8 . . . 8" table travel . . . 25" x 9" table . . . full automatic hydraulic table feed.

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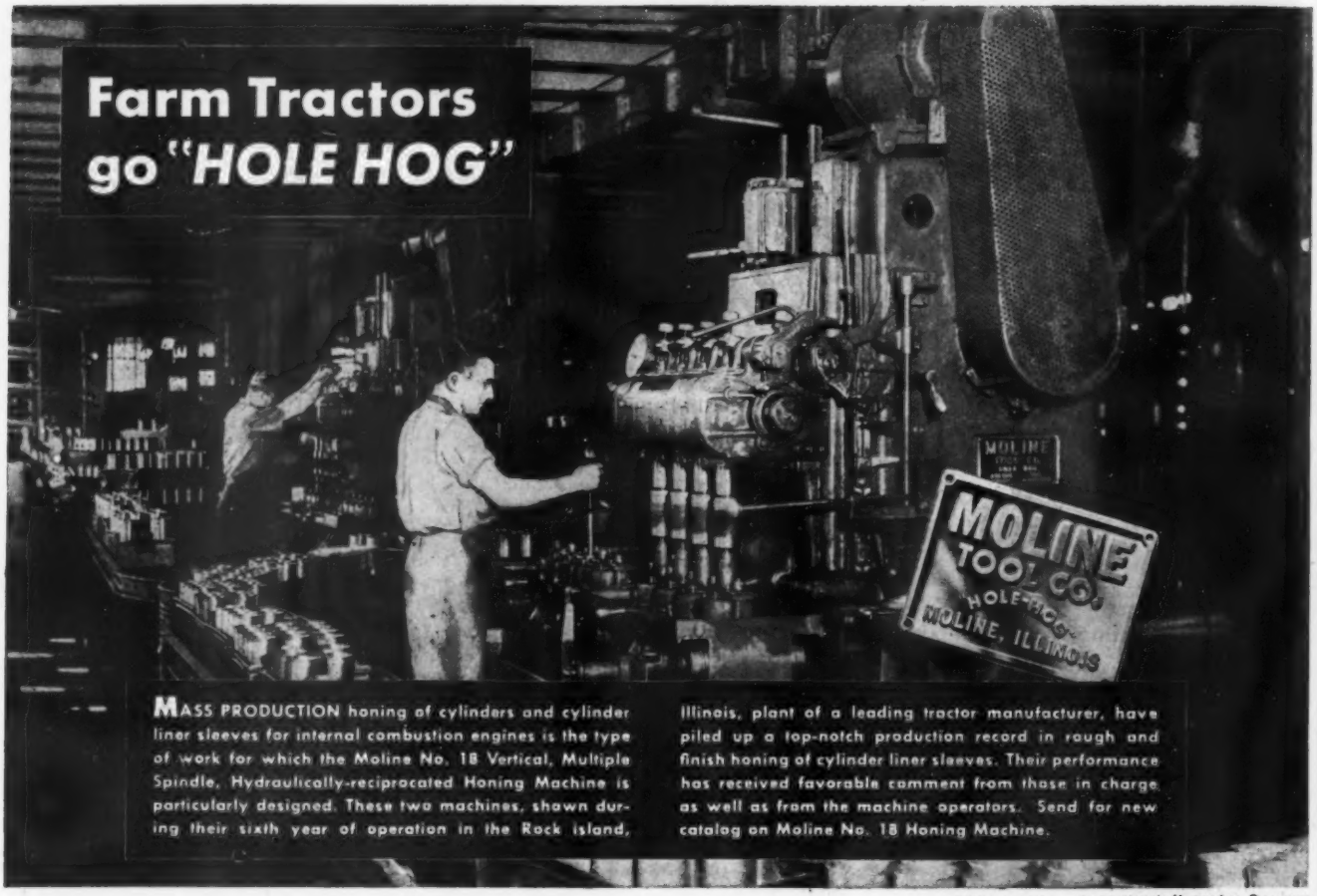
Farm Tractors go "HOLE HOG"



MASS PRODUCTION honing of cylinders and cylinder liner sleeves for internal combustion engines is the type of work for which the Moline No. 18 Vertical, Multiple Spindle, Hydraulically-reciprocated Honing Machine is particularly designed. These two machines, shown during their sixth year of operation in the Rock Island, Illinois, plant of a leading tractor manufacturer, have piled up a top-notch production record in rough and finish honing of cylinder liner sleeves. Their performance has received favorable comment from those in charge as well as from the machine operators. Send for new catalog on Moline No. 18 Honing Machine.

Photo courtesy International Harvester Company

Consider

LELAND GIFFORD

NO. 1 MOTOR SPINDLE DRILLING MACHINES

For Drilling Holes No. 80 to 5/16" diameter. Rigid, Accurate, Easy to Operate, Long Lived, Very Sensitive.

Send for Bulletin No. 400A

LELAND GIFFORD

WORCESTER 1, MASSACHUSETTS, U. S. A.

MILLHOLLAND

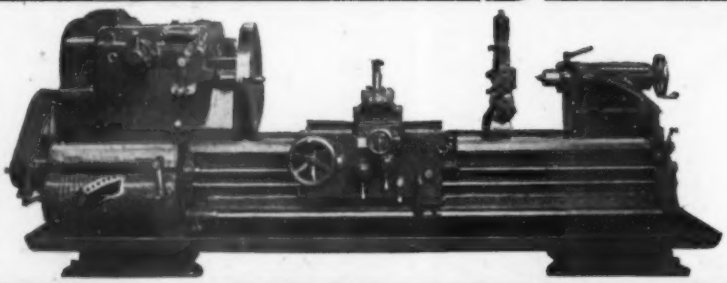
Automatic **DRILLING - BORING MILLING - TAPPING** *Units*

½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

SPRINGFIELD GEARED HEAD LATHES



for peacetime or war production!

A lathe purchased now, for round-the-clock war production, must still meet peacetime requirements. Therefore, specify SPRINGFIELD lathes —flexible, efficient, ideal for emergency or normal production. SPRINGFIELD lathes are built in sizes from 14" to 30". Write for descriptive bulletins, prices, deliveries, etc.

The SPRINGFIELD MACHINE TOOL COMPANY • • • SPRINGFIELD, OHIO, U.S.A.

Honing is the Better Solution to your FINISHING PROBLEMS

BARNESDRIL Honers Insure Maximum Production, Greater Accuracy, and Mirror Smoothness on Finishing Operations . . .

Where highly accurate straight round, smooth bores or finished exterior surfaces are required, BARNESDRIL Honing Machines, with proper abrasive tools, will cut metal away until the desired size and finish are obtained.

The right BARNESDRIL Honing Machine will give you these four results:

ACCURACY—Honing with suitable controlled hones corrects errors resulting from previous operations, and generates final geometric accuracy of both roundness and straightness of bore.

STOCK REMOVAL—Faster, more economical stock removal provided in one process to give final surface finish and accuracy required.

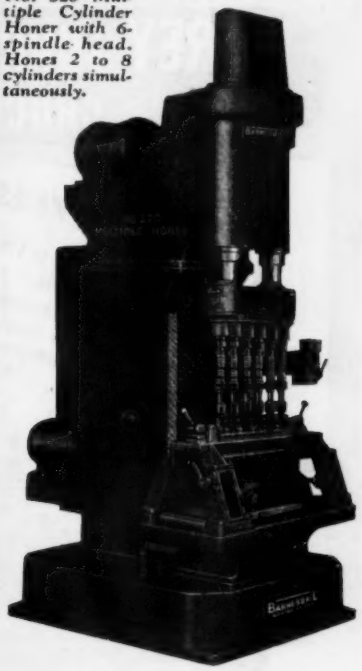
SURFACE FINISH—Proper honing gives any desired surface finish. All defects of previous commercial operations such as tool marks, hills and valleys, and grinder marks are removed, leaving a uniform, superior bearing surface.

FINAL SIZE—The accurate control of hone pressures, as applied with our exclusive hydraulic variable pressure controls, generates final dimensional size accuracy within tolerances of 0.0005" or less.

BARNESDRIL Hydraulic-Operated Internal and External Honing Machines are available in vertical, horizontal or angular types, with one or more spindles. There are over 18 different sizes and types of BARNESDRIL Honers which will finish work up to 42" in diameter and more than 75' in length. Accuracy of .0005" or less, and surface finish of 2 to 3 micro-inches (in high-speed production) is consistently maintained.

You accomplish *high production, precision* and *economy* with BARNESDRIL Honers. Send blueprints of parts for analysis and suggestions . . . without obligation. Our engineers will recommend the most suitable type and model of honing machine for your specific production requirements.

BARNESDRIL *No. 320 Multiple Cylinder Honer with 6-spindle head. Hones 2 to 8 cylinders simultaneously.*



BARNESDRIL *Honer produces mirro-like finish on these Tractor Cylinders.*

BARNESDRIL *No. 5-E Horizontal External Honing Machine for finishing exterior cylindrical surface of Long Piston Rods, Shafting and Tubing.*

FREE

HONING DATA

Write TODAY for your copy of Bulletin 121-A which describes completely the honing process with data and specifications of BARNESDRIL Honing Machines.

Barnes Drill Co.

830 CHESTNUT STREET

ROCKFORD ILLINOIS, U.S.A.

MOREY TURRET LATHES

for BAR or CHUCKING { UNIVERSAL or PLAIN

3 UNIVERSAL

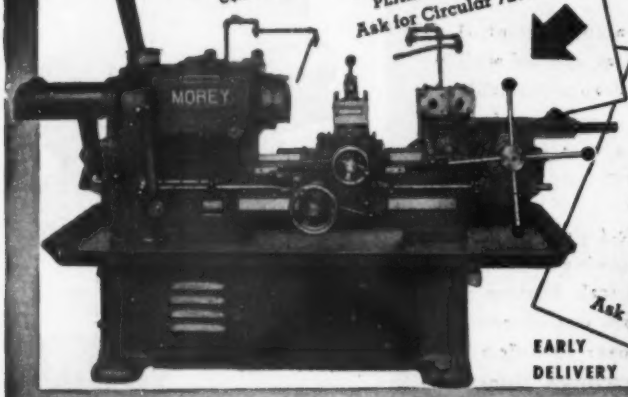
For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM. constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A

2 PLAIN-GEARED

For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM. constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A



EARLY DELIVERY

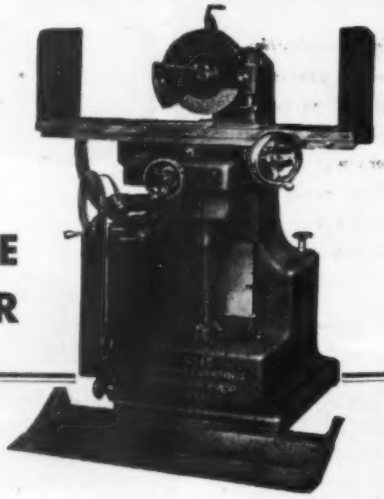
- INFINITE SPINDLE SPEEDS —Electrically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR NOISES (patents applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
- SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGIDITY WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS *MODERN* TOOLS WILL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF THE OPERATOR.

ARMY NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC
410 BROOME STREET, NEW YORK 13 N Y
PLANT 4-57 26TH AVE, ASTORIA 2, NEW YORK

GRAND RAPIDS
NO. 15
HAND FEED
SURFACE GRINDER



. . . a rugged machine for fine, accurate work

This high grade, motor driven machine will handle all work within its capacity with maximum convenience. Among the features which assure fine, accurate work and long precision service are the following:

. . . heavy, one-piece column and base
. . . precision ball bearing spindle
. . . careful guarding of wearing surfaces
. . . provision for wet grinding

This machine can be furnished with coolant system or dust collecting system.

Longitudinal Table Movement—19"
Transverse Table Movement—8½"
Vertical Movement—12"
Table—6"x18"

Send for illustrated literature giving further details.

GALLMEYER & LIVINGSTON CO.
330 Straight Street, Grand Rapids (4), Mich., U. S. A.

PORTAGE
HORIZONTAL BORING, DRILLING AND MILLING MACHINE NO. 4

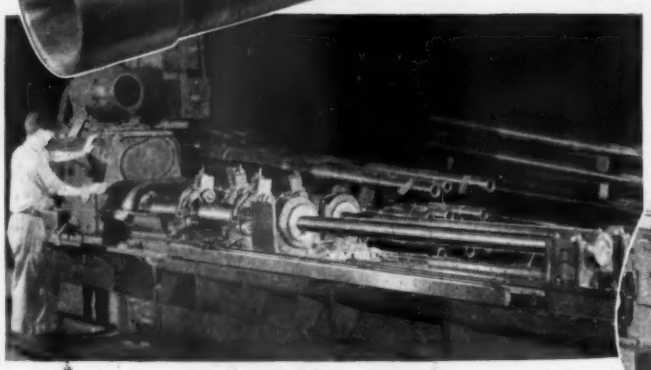
• Featuring an extended saddle and table with outer rail support for maintaining exceptional accuracy on long work. Get fully acquainted with the many features of this modern Boring Mill. *Ask for a copy* of our new instructive bulletin which points out the numerous advantages of this new Horizontal Boring, Drilling & Milling Machine.

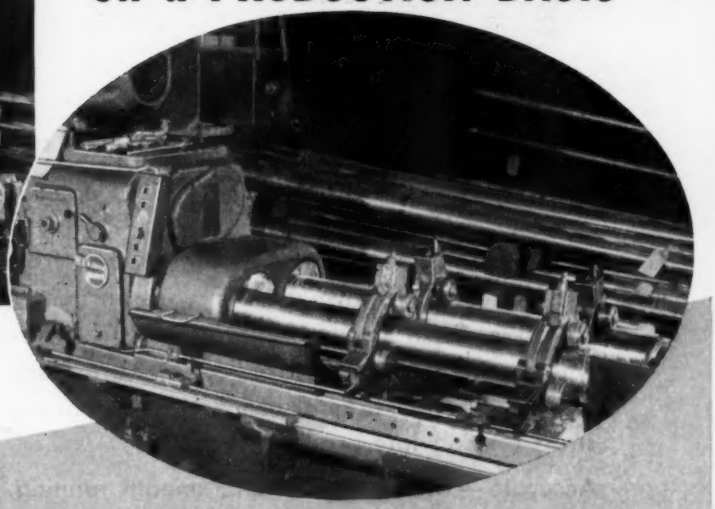
THE PORTAGE MACHINE CO.
AKRON 11, OHIO

HOW TO OBTAIN **Accuracy**

...in

DEEP HOLE DRILLING and BORING on a PRODUCTION BASIS





Barnes No. 420 Horizontal Two-Spindle Machine Produces Quality Work at Less Cost

● Six foot long shafts, 6½" outside diameter, made of AMS 6312 Seamless Steel, 331-333 Rockwell, are rough and finish bored on a W. F. and John Barnes No. 420 Two-Spindle Deep Hole Drilling and Boring Machine in this plant. In the first operation, a 5.470" diameter hole is rough bored, with a maximum allowable runout of ± .010". In the second operation, a 5.575" diameter hole is finish bored, with maximum allowable runout of ±.002". Two shafts are machined at the same time, and both the rough boring and finish boring operations are completed in 130 minutes each, floor-to-floor time.

ECONOMICAL, EFFICIENT, HIGH PRODUCTION DEEP HOLE DRILLING AND BORING

For plants where single spindle general purpose machines of standard design for drilling and boring are in use, the Barnes No. 420 Horizontal Deep Hole Drilling and Boring Machine is a profitable and economical investment. Outstanding features of this time and money saving machine are:

1. Two spindles work together . . . double production in the same amount of floor space taken by single spindle machine.
2. Feed and spindle speeds always in definite relation . . . constant hydraulic feed.
3. Massive head together with long bearing surface permits heavy feeds . . . better production.
4. Pack bit boring can be done without boring preliminary guide hole . . . one operation eliminated.
5. Hollow spindles permit removal of pack bit without returning through bore . . . no scratches.

Rifle drilling, conventional drilling and cylinder boring operations are successfully and economically performed with this Barnes machine. It will drill and bore parts like crankshafts, camshafts, drive shafts, propeller shafts, hollow spindles, hydraulic cylinders, printing press rolls, axles, connecting rods, recoil cylinders, etc. By using cradle-type fixtures, non-symmetrical parts can also be machined.

Barnes engineers will show you how you can increase production on your deep hole drilling and boring jobs, and at lower costs. Blueprints of the part together with "part" data will bring detailed recommendations, without cost.

Write for DEEP HOLE DRILLING DATA . . . useful deep hole drilling and boring information, together with deep hole tooling setups, will be sent without obligation.

W. F. & JOHN BARNES

W. F. and JOHN BARNES

310 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.

HERE'S HOW TO BE . . .

Geared FOR Action

"says Stop-Watch Pete of R.T.L.S.H."

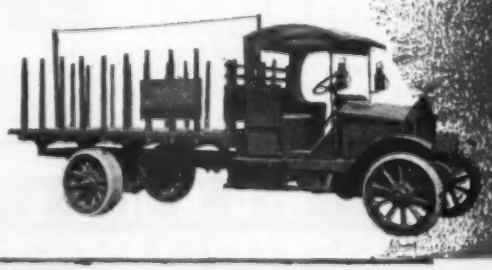
Use the knowledge and experience—tried and proved—that we have acquired in making gears since 1896.

Straight and hourglass type worms made from finest alloy steels have worm threads hardened, precision finish ground and polished. Worm wheels—either straight or helical cut—are made from highest grade gear bronze to stand heavy stress and obviate granular failure.

Accurate — strong — quiet and smooth running, **BAUSH WORM GEARS MADE TO YOUR BLUEPRINTS** will give maximum efficiency, with low maintenance for your present or newly designed

BAUSH Hourglass worm and wheel assemblies in M-4 Tanks, and other war weapons, gave outstanding performance during World War II.

34 years ago BAUSH worm and wheel gears were transmitting power in electric and gasoline automobiles and trucks.



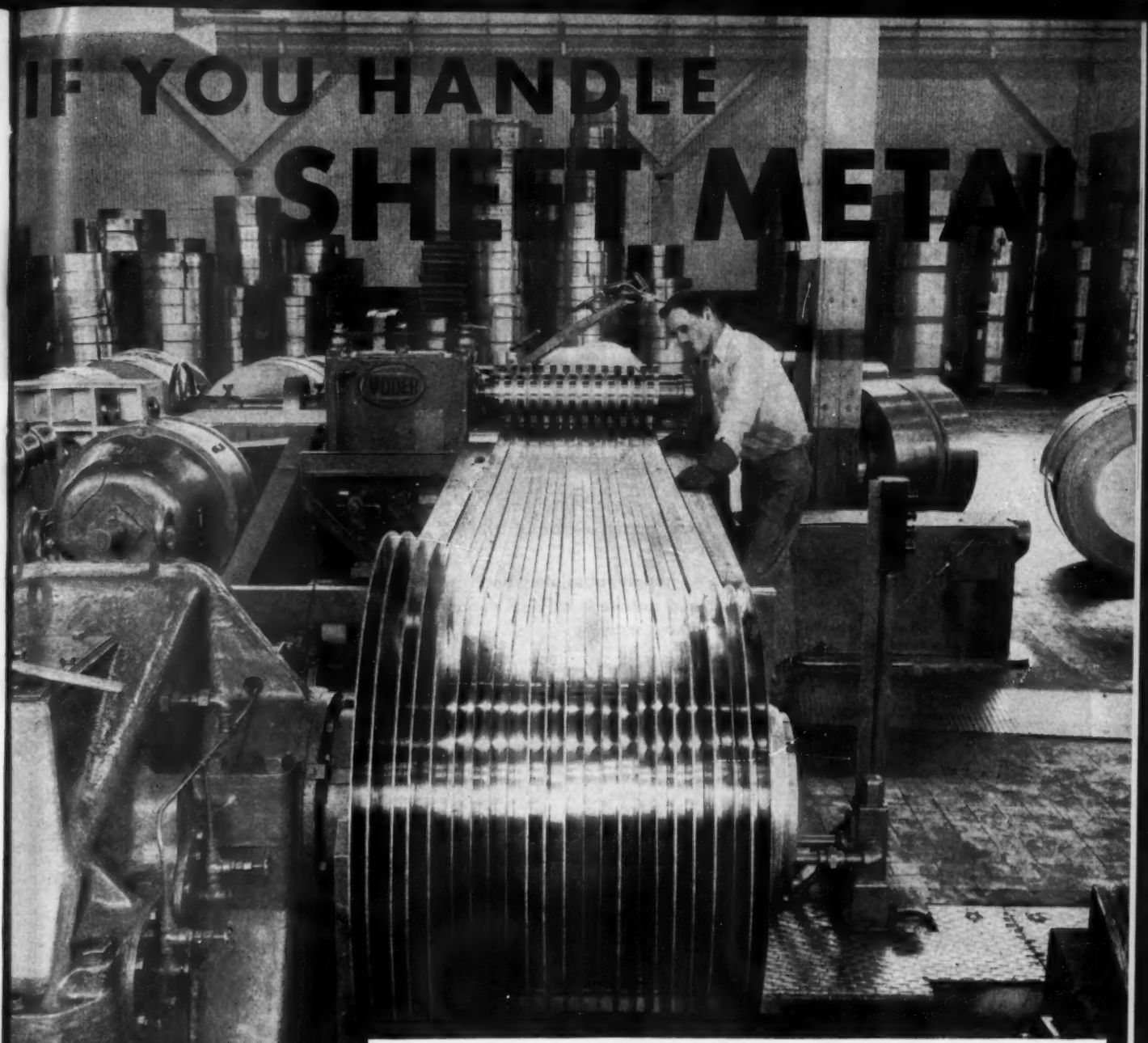
MACHINE TOOLS—INDUSTRIAL TRUCKS—HOISTS—STEAM TURBINES—AGITATORS and CONVEYING MACHINERY

Tell us your worm gear needs—send us your blueprints—our facilities and experience are at your service.

BAUSH

MACHINE TOOL CO.

SPRINGFIELD 7, MASSACHUSETTS



YODER MACHINES WILL SPEED YOUR PRODUCTION

● If you handle metal, in sheet, strip or coils . . . whether you roll it, convert it, job it or fabricate it . . . make ash cans or aircraft sections, doohickies or dump trucks . . . there is Yoder machinery to make the handling or fabricating easier and more profitable. Yoder's specialty is high production metal working machinery, from slitters and coilers to cold forming mills for 24" resistance weld pipe. If we don't have the right machinery for your metal handling problem, we can design and build it for you.

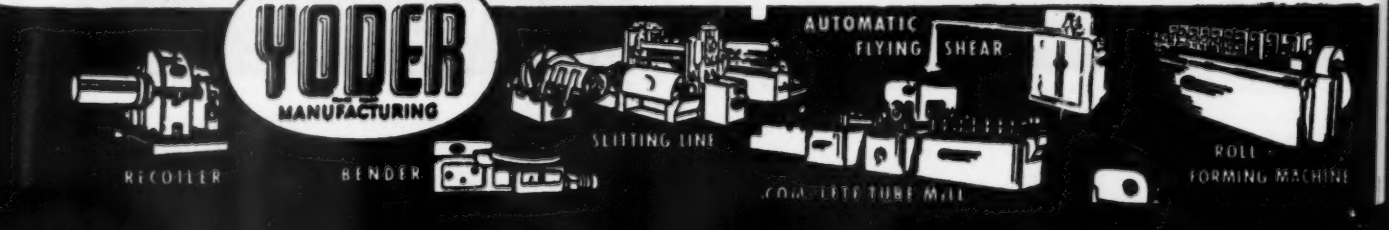
ASK FOR A YODER BULLETIN

THE YODER COMPANY

5514 Walworth Avenue, Cleveland 2, Ohio, U.S.

METAL • WORKING • PRODUCTION • MACHINERY •

ENGINEERING YODER MANUFACTURING



For SPEED and ACCURACY
IN DIE PRODUCTION-

GEMCO

Multi-Purpose SHAPERS

In 16", 20", and 24" Sizes.
Exclusive "LUBRIGARD" Safety Device Increases the Precision Life

We recently received this letter from the head tool maker of a shop using a 20" GEMCO Universal Shaper, a man of over 50 years' experience in tool and die work:

"This is a mighty good tool, easy to handle, absolutely accurate even on a 20" stroke. The machined surface is as near smooth and straight as it can be made without scraping."

The Universal Type of GEMCO Shaper, shown above, is ideal for tool and die work, or where angular set-ups are required.

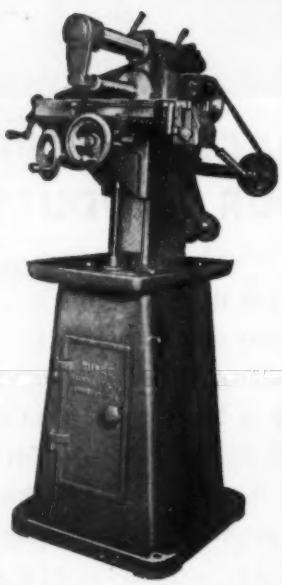
Write Today for Bulletin GC-12A

Manufacturers of PRECISION MACHINERY Since 1917

GENERAL ENGINEERING & MFG. CO. • ST. LOUIS 4, MO.

BURKE MILLING MACHINES

. . . Put Your Small Work on a Production Basis!



Those small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises—3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request — Write!

BURKE MACHINE TOOL CO.
CONNEAUT • • • OHIO

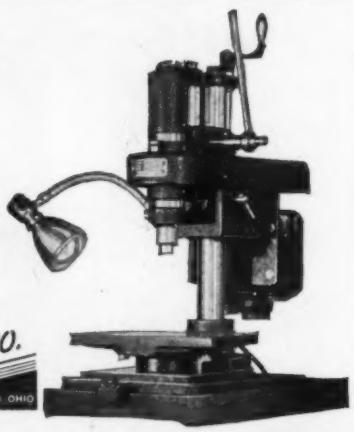
Precision-Built For Precision Drilling

HAMILTON "VARIMATIC"

for small holes .004" to 5/16" dia.

A super-sensitive drilling machine of uncanny precision and radical departure in design to achieve an infinitely variable range of speed, sensitivity, ease of operation and all-'round performance. Speed ranges from 840 to 9300 r.p.m.

Write for new bulletin



THE HAMILTON TOOL CO. HAMILTON, OHIO

ABRASIVE
ACCURACY BOOSTS PRODUCTION

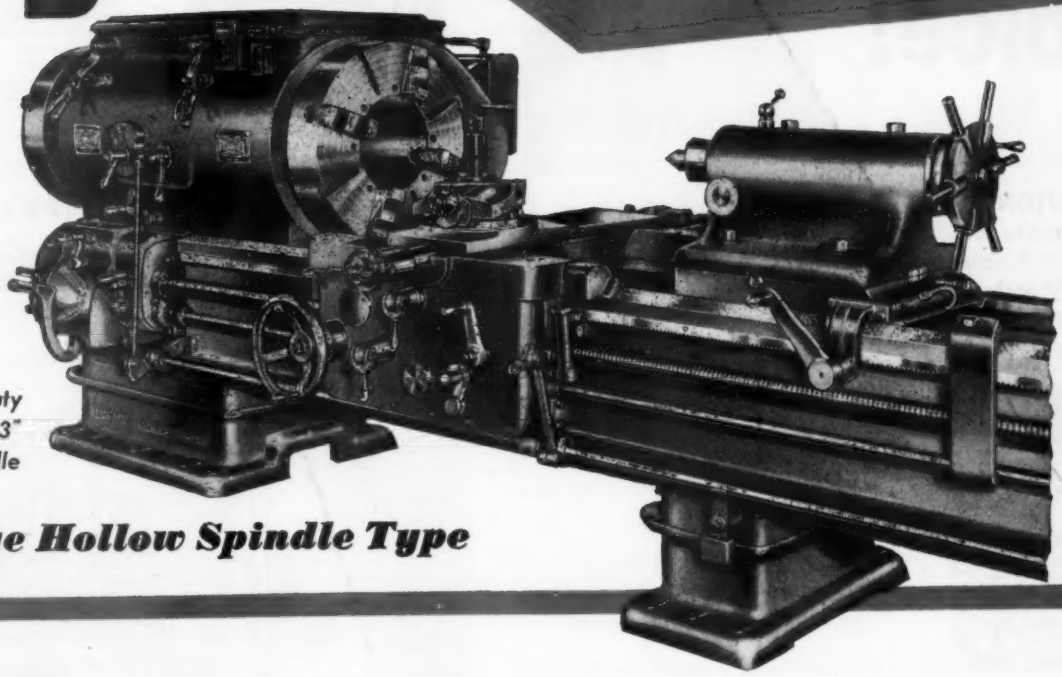
No. IG	INTERNAL GRINDER	**No. 34**	VERTICAL SPINDLE SURFACE GRINDER
No. 1½	HAND FEED SURFACE GRINDER	**No. 3B**	AUTOMATIC FEED SURFACE GRINDER

Look for Our Full Page Advertisements

ABRASIVE MACHINE TOOL CO.
EAST PROVIDENCE 14, RHODE ISLAND

Do Important Machining Jobs in 1/2 to 1/7 the Time!

on a Hydratrol Lathe



30" Heavy Duty Lathe with 13" Hole in Spindle

Large Hollow Spindle Type

Yes, in a number of big plants important operations are being performed in 1/2 to 1/7th the time of previous operations. In one plant, Large Hollow Spindle Type of HYDRATROL LATHES are saving 15,000 man hours per month! Why not let us show you what a HYDRATROL LATHE could do in *your* plant?

5 SIZES—18" to 36"

Small	**18" up to 7¼" Hole**	**Large**	**30" up to 14" Hole**
Medium	**24" up to 12" Hole**	**Large**	**36" up to 16½" Hole**
Large	**27" up to 13" Hole**	*(Standard Type lathes, 16" to 36")*	

7 Distinctive Features:

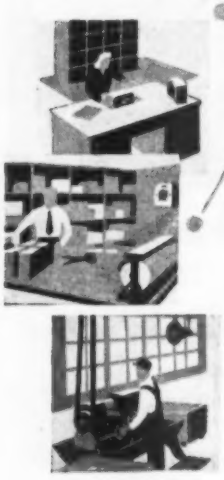
- ★ Easy, Fast, Simple Operation.
- ★ Hydraulic Brakes and Clutches.
- ★ Absence of Mechanical Troubles.
- ★ Automatic and Ample Lubrication.
- ★ Mechanism Protected by Automatic Control.
- ★ Extraordinary Hardness of Bed.
- ★ Available with Large Turrets for carriage which fully utilize the Great Power Capacity of these machines; and Beds on both ends of Headstock.

Lehmann MACHINE COMPANY

CHOUTEAU AT GRAND ★ ST. LOUIS 3, MISSOURI

Every dept. of your business within easy reach of your voice!

EXECUTONE Inter-Com gives you automatic control of your entire organization through *instant voice-to-voice contact!* A mere press of a button enables you to talk directly with any member of your staff, no matter how far away he may be from your office.



EXECUTONE eliminates the endless running back and forth from one office to another. Instructions may be given—questions asked and answered—without taking anyone away from his work!

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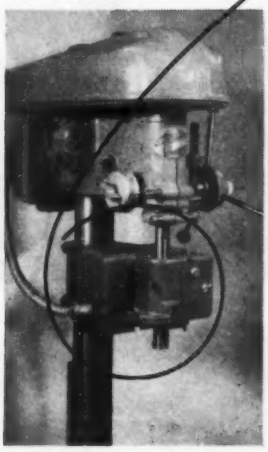
LEAD SCREW TAPPING...

ON YOUR OWN DRILL PRESS!

Precision ground lead screw provides accurate, controlled tapping from 0-80 to ⅞"



With this ROTOREX tapping head you can convert your drill press to a precision tapping machine in a matter of minutes, and consistently produce Class III threads. To change to drilling, simply swing the ROTOREX to one side.

Employing the same principle as expensive tapping machines, the ROTOREX uses a precision ground lead screw for positive, automatic control of tapping leads and operates on a complete automatic cycle. It is rugged in construction, economical and can be operated with unskilled labor.

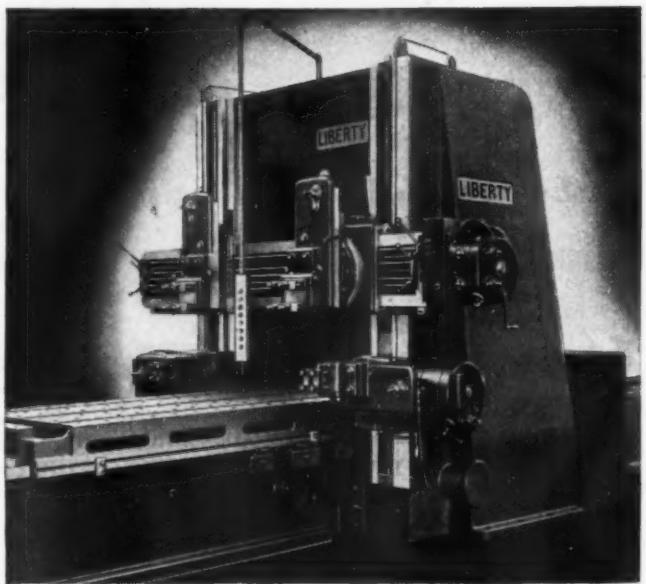
CHECK THESE FEATURES:

1. Positive, automatic control of lead.
2. Hardened, precision ground lead screws.
3. Instantaneous emergency reverse.
4. Complete automatic cycle.
5. Accurate control of depth—accuracy to .010.
6. Foot control frees operator's hand for loading.
7. Capacity 0-80 to ⅞"
8. Price complete, $175.00, F. O. B. factory.

$175.00

DOUGLAS ROTOREX PRECISION TAPPER

DOUGLAS MACHINERY CO., INC., 150 BROADWAY, NEW YORK 7, N. Y.



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SMALL, MEDIUM AND HEAVY DUTY

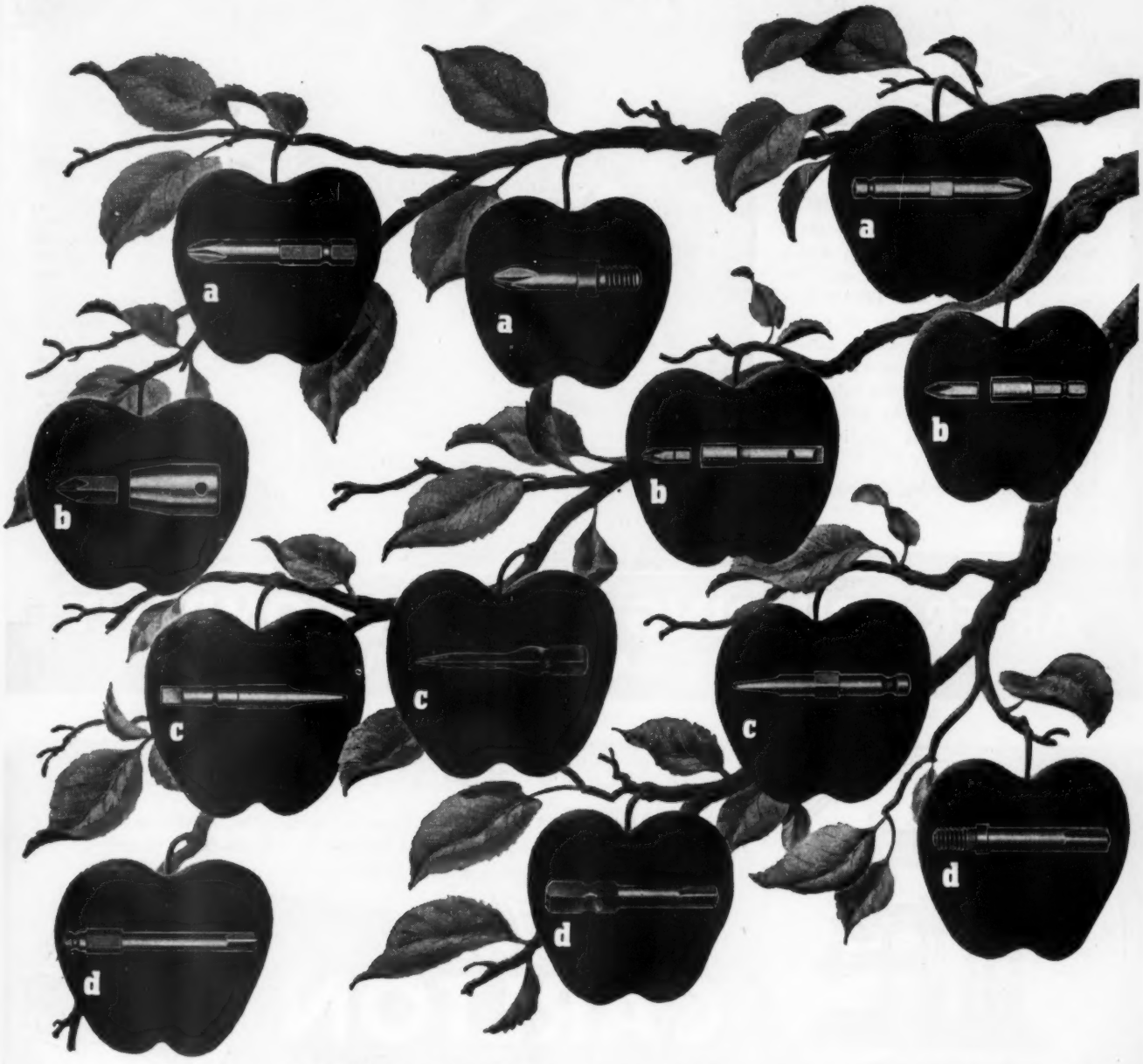
PLANERS

FOR HIGH SPEED, LOW COST PRODUCTION

LIBERTY PLANERS • HAMILTON, OHIO, U. S. A.

Over a Quarter Century of Specialized Experience with Time Tested Principles of Design

Take your pick of Apex tools for driving screws!



a. Power Bits and Hand Drivers for Phillips Recessed Head Screws (Catalog No. 15)

b. Insert Type Power Bits and Hand Drivers for Phillips Recessed Head Screws (Catalog No. 102)

c. Power Bits for Slotted Head Screws (Catalog No. 16)

d. Power Bits and Hand Drivers for Clutch Head Screws (Catalog No. 17)

There's always a bumper crop on the Apex family tree: bits for practically every make of air or electric driver, for every size and style of screw. With Apex-Phillips bits you can take your choice of the solid type (send 'em back and we recondition them at a fraction of the original price) or the insert type (throw away the worn out tips and insert new ones). *Pick out* the Apex bits you need, *pick up* speed in your assembly departments, and *bear down* on tool costs.

APEX

THE APEX MACHINE & TOOL COMPANY • DAYTON 2, OHIO

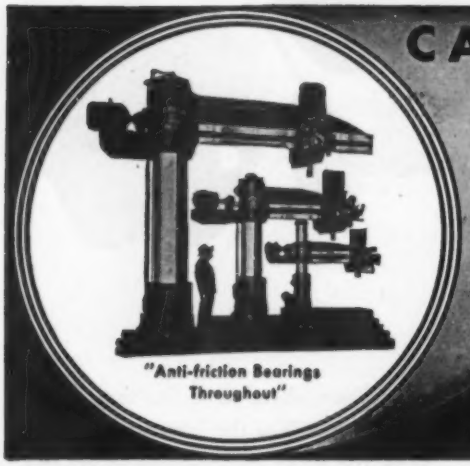
ARTER

The range of application of
ARTER ROTARY SURFACE GRINDERS
is broad. ARTERS are built with chuck capacities from 8" to 40" with models available both mechanically and hydraulically operated, with tiltable work tables for grinding concave or convex work. For grinding gear shaper cutters, ball bearing spacers in pairs to parallelism of .00005", connecting rods, saws, thrust collars, gear surfaces, slitters, and countless other products look into ARTERS.

For your surface grinding, call on ARTER engineers.

ARTER GRINDING MACHINE COMPANY
WORCESTER, MASSACHUSETTS • U. S. A.

CARLTON RADIAL DRILL



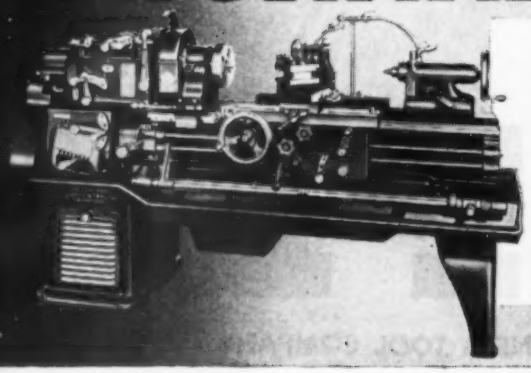
"Anti-friction Bearings Throughout"

FEATURES — 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The
CARLTON
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

ARMY E NAVY

CINCINNATI LATHES



CINCINNATI LATHES—*Faster, Cleaner Turning Assured*
Valuable time can be saved on all classes of work by CINCINNATI LATHES. Modern features of design which assure faster, better work justify their place in the ranks of truly high production machines. Low cost on a wide range of work is made available through versatility in tooling. Sizes: 14" to 30".

Get full details today.

THE CINCINNATI LATHE & TOOL CO.
Rogers Road, Oakley SPECIALISTS SINCE 1906 Cincinnati, Ohio

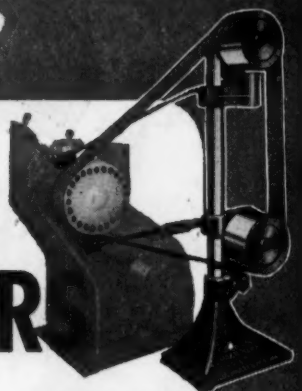
Hammond

OF KALAMAZOO

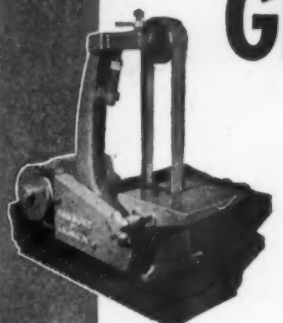
Wet-N-Dri 4" belt model — Type 400

Abrasive Belt GRINDERS-POLISHER

FOR FASTER, BETTER FINISHING



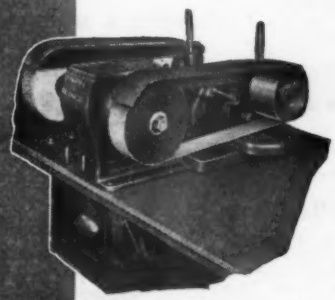
BACKSTAND No. [illegible] (shown) see Model 3 left column



Flexible Belt Unit, 2" type F-2

Here Hammond offers you the machines for doing a better grinding and finishing job with abrasive coated belts. They are built to the highest standard of machine tool construction and provide low cost, high production units for the particular job to be done. Whatever your problem . . . investigate the available Hammond machine for handling it.

CYLINDRICAL FINISHING UNIT — Model OD [illegible] shown



GRINDER-POLISHER COMBINATION — Use either belts or wheels or both, 3" belts

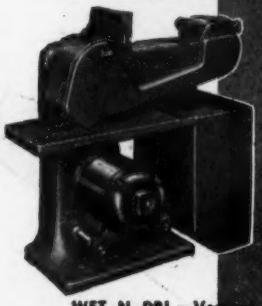
FLEXIBLE BELT UNIT — Inexpensive bench or pedestal type for replacing the slow, more costly grinding and finishing methods now being employed throughout your plant.

GRINDER-POLISHER COMBINATION — Uses belts or wheels or both on same machine, whichever set up is required to do the job. Available in bench and floor types.

BACKSTAND-POLISHING LATHE UNITS — handles heavy duty finishing jobs faster . . . better.

BACKSTANDS — Either bench or floor types for converting your present Polishing equipment into belt finishing units.

CYLINDRICAL FINISHING UNITS — for ¼" to 9" outside diameter tubes, rods, bars.



WET-N-DRI — Ver[illegible] and Horizontal 6" [illegible]

BACKSTAND No. 3 and Hammond Variable Speed Polishing Lathe Unit

WET-N-DRI 4" and 6" Horizontal-Vertical GRINDERS, either bench or floor type units for high production, low cost finishing.

HEAVY DUTY — 8" and 10" Vertical floor type GRINDERS — Wet-n-Dri operating, handle wide range of small and large parts to be finished.

HEAVY DUTY — 8" and 10" Vertical Grinders (Model V-10 shown)

Hammond Machinery Builders INC.

OTHER HAMMOND PRODUCTS: [illegible] GENERAL PURPOSE & ABRASIVE BELT GRINDERS • AUTOMATIC & CYLINDRICAL FINISHERS • POLISHING LATHES

1618 DOUGLAS AVE. KALAMAZOO 54, MICH. • EASTERN BRANCH: 71 W. 23rd ST. NEW YORK 10, N. Y.

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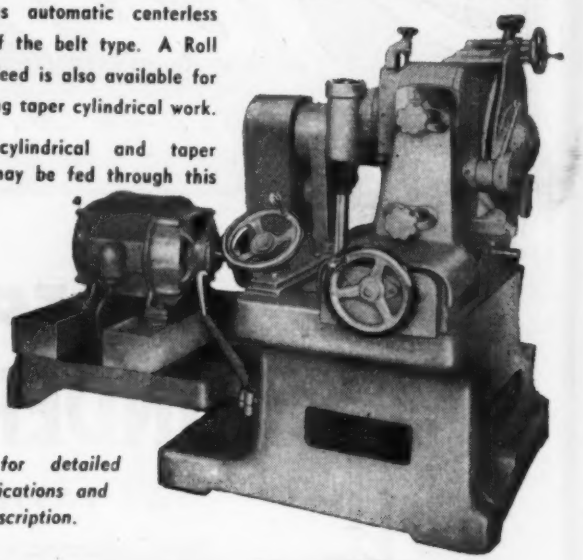
Assure better finishing at lower cost by putting your cylindrical work on the No. 101 "PRODUCTION" POLISHING MACHINE

With this machine no special skill is required to produce fine work and keep costs down. It provides automatic centerless feed of the belt type. A Roll Type Feed is also available for handling taper cylindrical work.

Both cylindrical and taper work may be fed through this machine with inexperienced labor and a superior finish obtained at fastest feed speeds.



Send for detailed specifications and description.

PRODUCTION MACHINE CO.

Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.

GREENFIELD, MASS., U. S. A.

For cutting internal keyways, slots or splines 1/10" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

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Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin—also circulars on Drill Grinders, Point Thinners, Tool and Cutter Grinders, Face Mill Grinders and Tool Bit Grinders.

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DIE SINKERS
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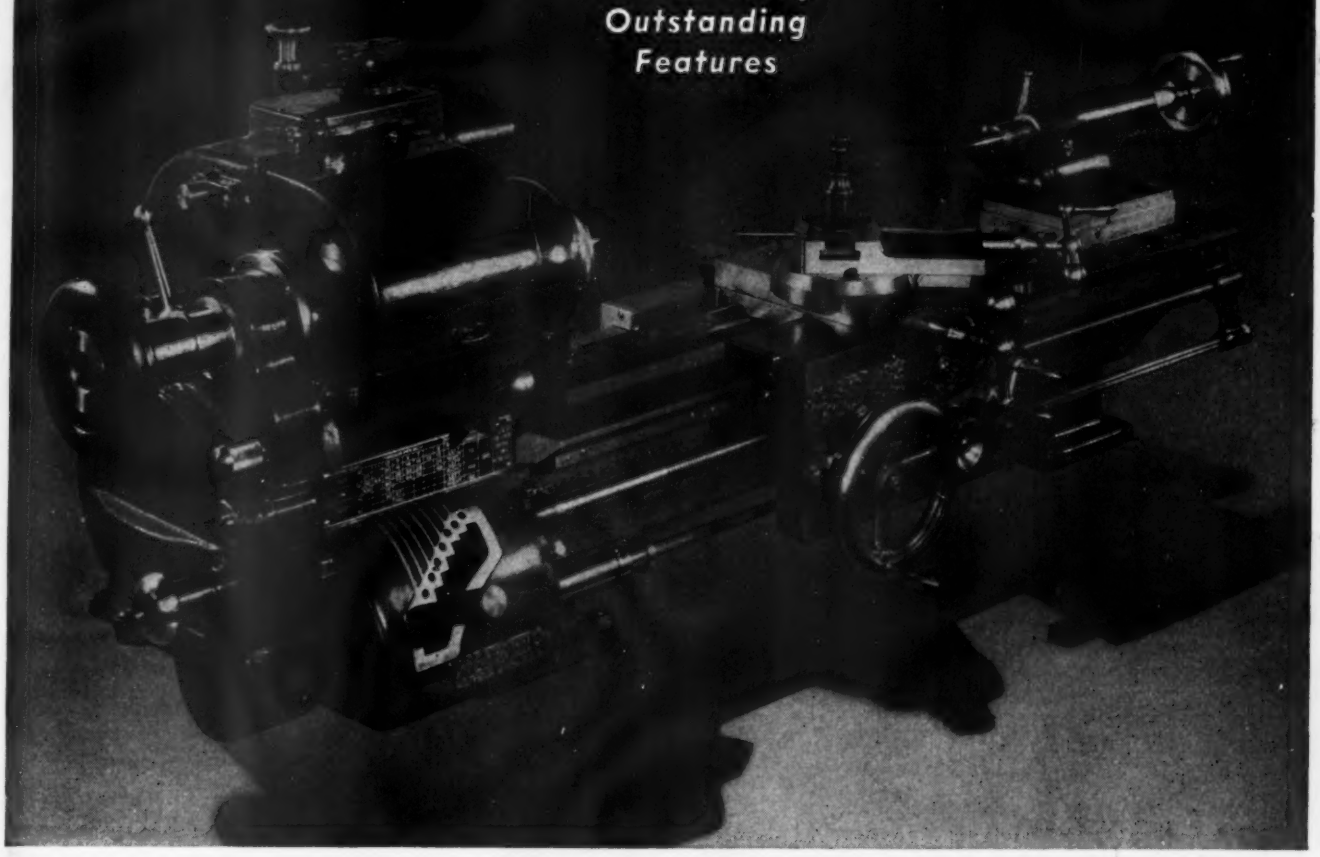
VERTICAL MILLERS
INJECTION MOLDERS

REED-PRENTICE CORP.
WORCESTER MASS. U.S.A.

It Will Pay You To Check Up On This WADE TOOLMAKERS' PRECISION LATHE

It Has Many Outstanding Features



This No. 8-A Wade Toolmakers' Precision Lathe will meet your every requirement as to precision, versatility and stamina . . . for it is a carefully built lathe with many important features. The spindle has a 1" collet capacity, and is supported in a double row roller bearing, close to the nose. Thrust is taken on a precision ball bearing. The bed is 44", with 8½" swing. It is built on the correct principle of narrow guideways with broad wearing surfaces; it has lasting accuracy and the ability to take the heaviest cuts. The rugged tailstock spindle always has a bearing the full length of the barrel, has a scale graduated in 1/16ths, and a micrometer dial. It has a quick change gear box, and cuts threads as coarse as 6 TPI. Exceptionally close tolerances are possible. ***Write today for catalog***

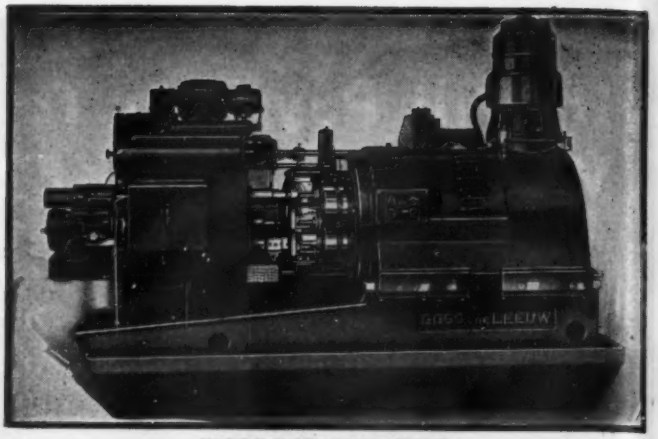
Wade

Bench Lathes and Profilers
For Precision, Versatility
And Stamina

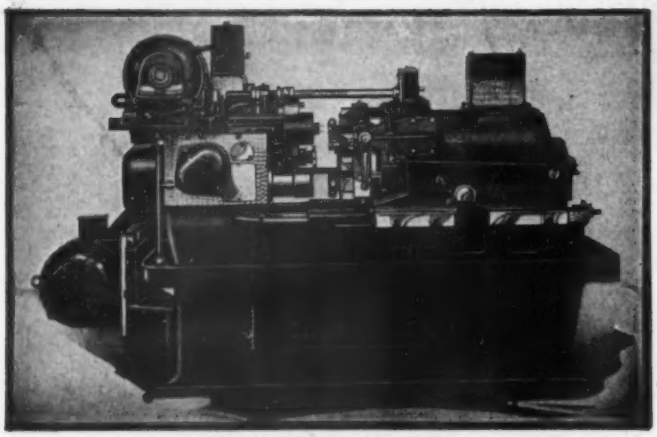
THE WADE TOOL COMPANY

WALTHAM 54, MASSACHUSETTS

GOSS & DE LEEUW
Multiple Spindle
CHUCKING MACHINES



WORK ROTATING TYPE
5 Spindles • 6 Spindles • 8 Spindles



TOOL ROTATING TYPE
4 Spindles • 5 Chucking Positions

Both types of machines provide lead screw threading. Oversize spindles on these machines are mounted on pre-loaded anti-friction bearings. Ways are hardened; gears are of chrome-nickel steel, carefully heat-treated.

The many modern features offered in these machines are fully described in catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

★ ★ ★

THE MACHINE THAT SOLVED MANY OF BRITAIN'S SHEET METAL PROBLEMS IN THE EUROPEAN WAR!

The "GRAMPUS" Nibble Shear

U.S.A. Patent No. 2333293. Patented also in Canada. Other Patents pending.

Trims difficult Pressings, Channel Sections, Fanels, Tubes, etc., in all metals, and in many materials, including: Hide, Fibre and Paper. Seams, Tucks, Beads, Grooves with Form Tools in place of Cutters.

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(Proprietors: California in England Ltd.)
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DAVIS KEYSEATER
This low cost machine will handle internal keyseating jobs up to 1¼ in.
Write for illustrated bulletin.
DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

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FOR FURTHER DETAILS SEE FULL PAGE AD IN PREVIOUS ISSUE
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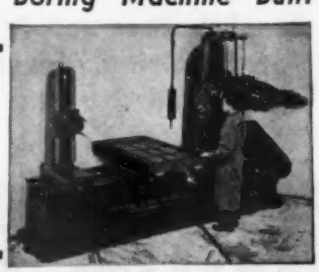
ST. LOUIS MISSOURI

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

SUNDSTRAND

YOUR GUIDE TO BETTER, "ENGINEERED" PRODUCTION MORE PROFITABLE MILLING

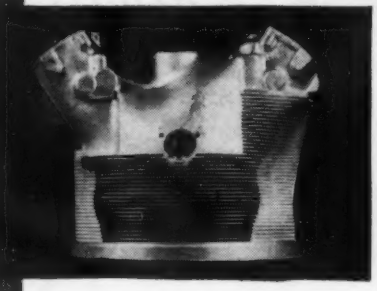
Production milling problems vary from one plant to another and from one industry to another. Consequently, *each* problem must be analyzed thoroughly in order to obtain the most economical solution. Production, as well as equipment, *must be "engineered"*.

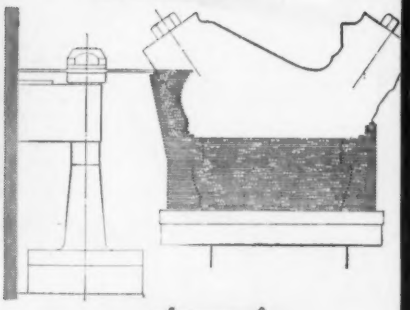
WHAT "ENGINEERED" PRODUCTION IS AND WHAT IT CAN DO FOR YOU

Sundstrand "engineered" production is a service provided by a staff of competent engineers who have had wide experience with metal working problems in all types of industries.

This experience has been responsible for effecting greater production, better accuracy and finer finish in countless installations. A Sundstrand production engineer will be glad to help you on production milling problems. There is no obligation for this service.

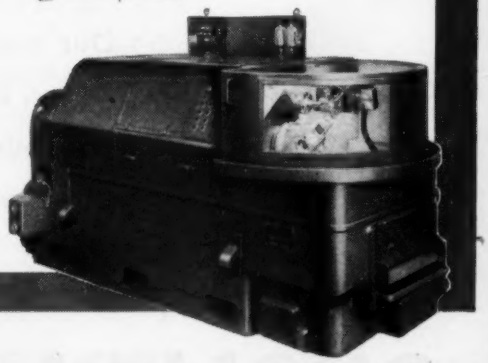
A TYPICAL MILLING PROBLEM / SOLUTION

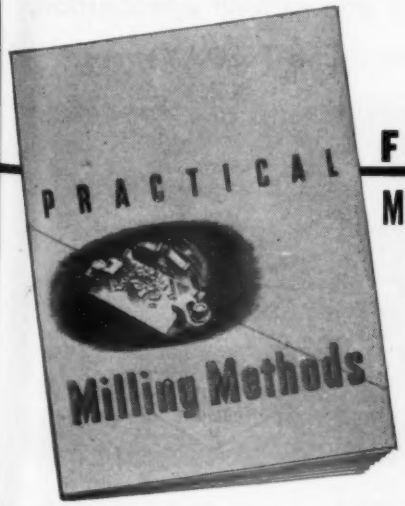




MILLING FINS IN AIRPLANE CYLINDER HEAD FORGING

One of the outstanding features of this special machine is the arrangement for controlling the contour of the cut and the cutter load. Hydraulic feed against a positive cam controls the contour. An automatic electronic feed control keeps the cutter loaded to full capacity. Where the cut becomes light, the rate of feed increases—when heavy, the feed rate automatically decreases.





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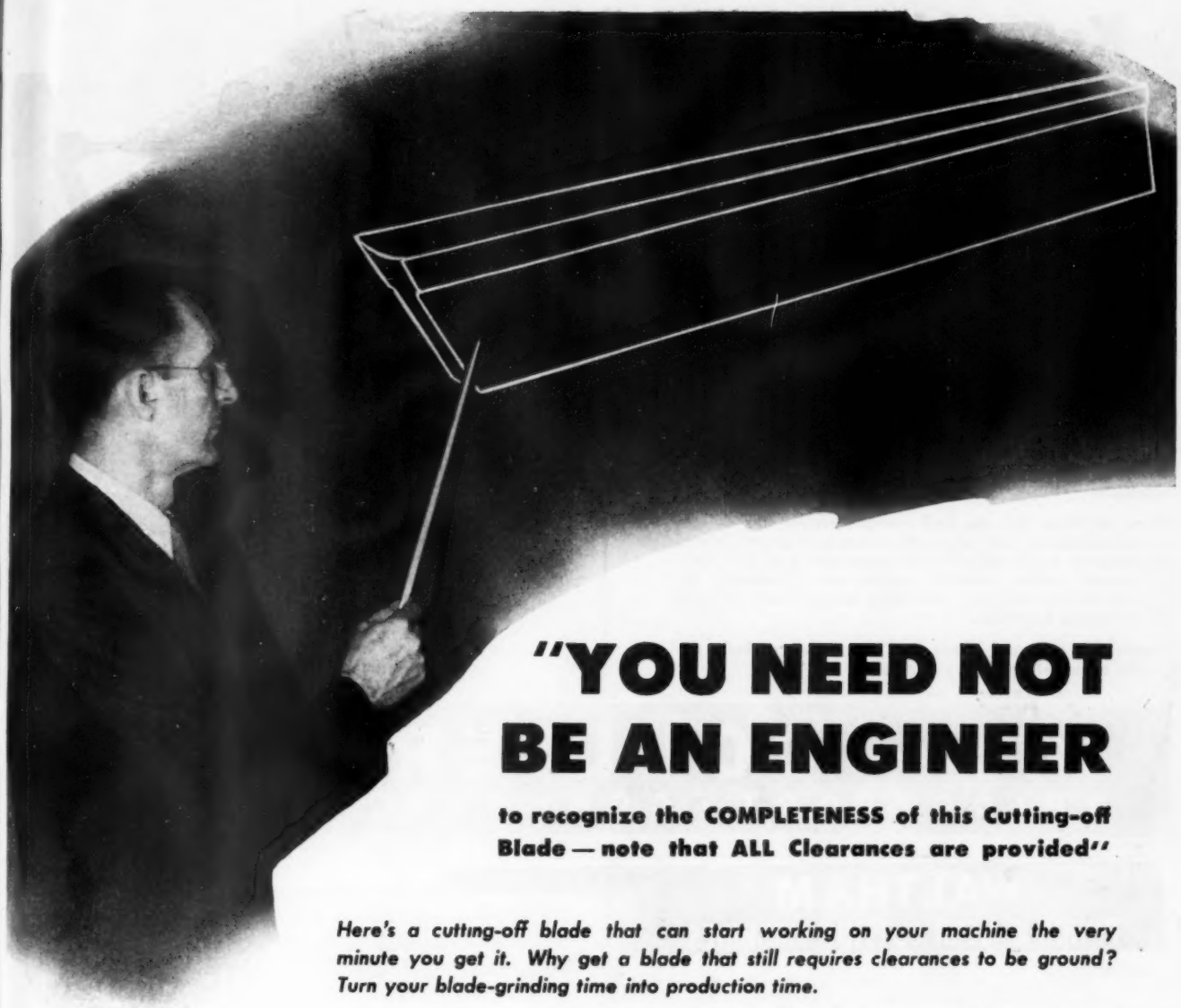

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Here's a cutting-off blade that can start working on your machine the very minute you get it. Why get a blade that still requires clearances to be ground? Turn your blade-grinding time into production time.

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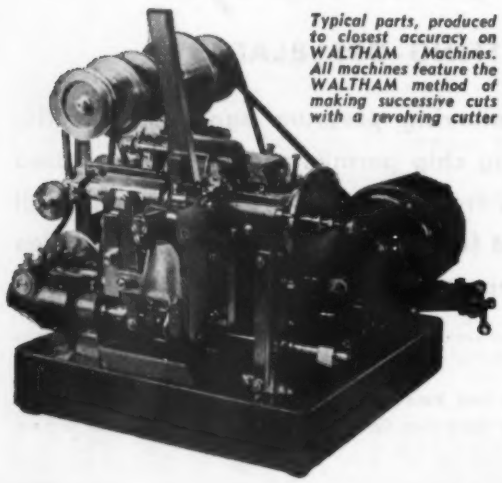
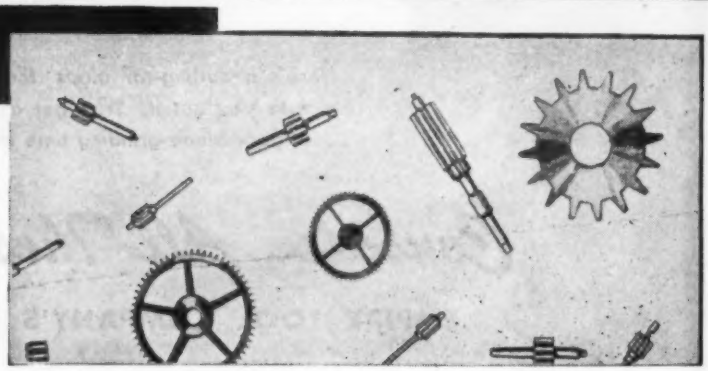
for precision production of fine pitch mechanisms



Typical parts, produced to closest accuracy on WALTHAM Machines. All machines feature the WALTHAM method of making successive cuts with a revolving cutter



Single-Cut Pinion Machines This machine employs one cutter. Blank is positioned and machine started by hand, all other movements being automatic.

Multiple-Cut Pinion Machines Two or three cutters on arbor of cutter spindle make successive cuts. Machine stops on completion of last cut.

Magazine-Fed Pinion Machines Provides continuous production of one kind of pinion. Magazine is loaded and all other operations including cutting and ejecting are automatic and continuous.

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THE Model "LR" Lo-swing's field includes practically any work within its capacity—2″ diameter for heavy stock removal, 4″ diameter for light cuts, 5″ diameter for flanged work—and up to 46″ between centers in the longest bed length. Ease of setup and operation are provided not only by the Simplified Change-over Mechanism but by convenient levers for throwing in and out the feed and rapid traverse (normally automatic) manually, and by the low center height (37-⅞″) which allows the operator to examine and adjust all tools from the operating position. Low center height also contributes to ease of loading.

The model "LR" is designed to provide maximum efficiency with carbide tools. It is a versatile lathe in that it may be equipped with either direct V belt drive to the spindle for high speed, fine finishing cuts, or a geared drive with pick-off gears for slower roughing cuts. This lathe may also be equipped with a third slide (overhead) as well as additional back squaring attachments, carriages and carriage slides, making for innumerable tooling possibilities.

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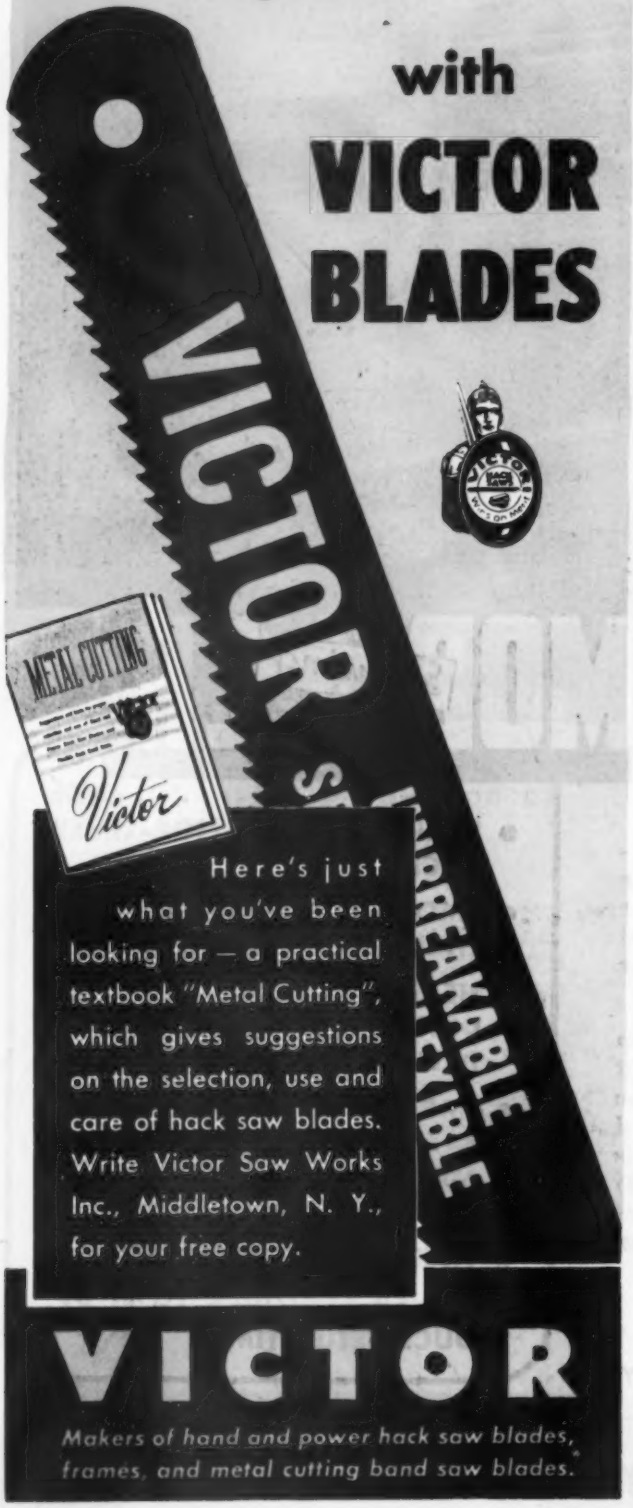

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VICTOR

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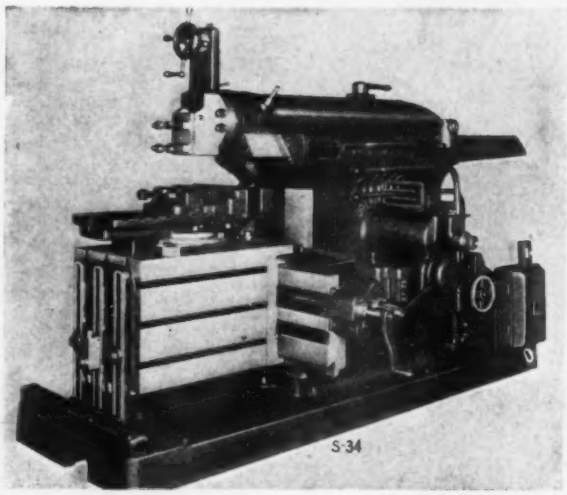

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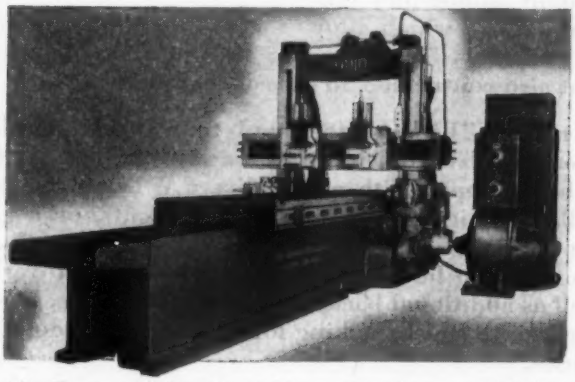
Ask for our Bulletin 59.



Ohio Planers, with five types of drive to choose from, are adapted to a wide range of needs. This is modern equipment well known for satisfactory performance and long life. Ask for Bulletin 500.

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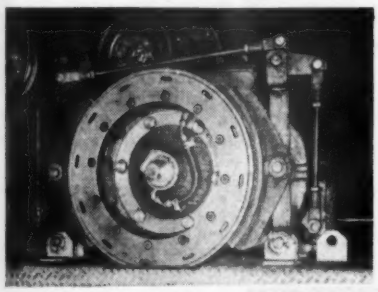
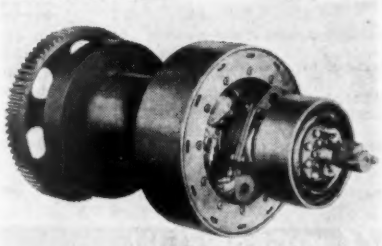
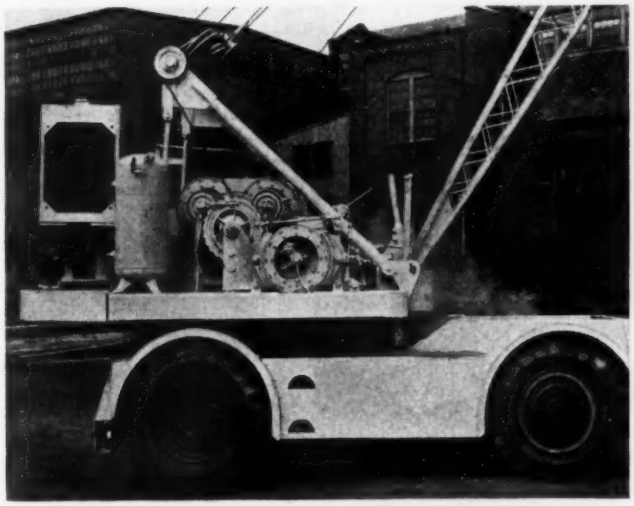


Main propel mechanism of the Shovel above—Fawick equipped.



Hoist drum assembly of the Shovel above—Fawick equipped.



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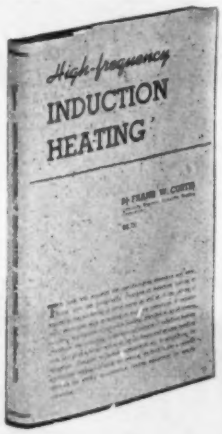

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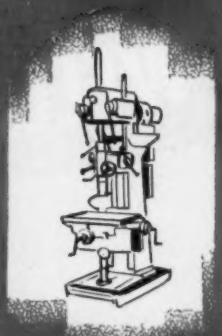
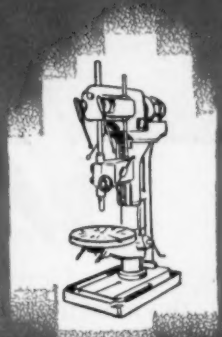


Cleereman Box Column Drilling Machine.



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6. Files and Work Benches
7. Babbitting, Brazing, Soldering Welding
8. Gearing
9. Turning and Boring
10. Milling Machine Feeds and Speeds
11. Grinding, Honing and Lapping
12. Screw Machine Tools. Speeds
13. Punch Press Tools
14. Broaches and Broaching
15. Bolts, Nuts and Screws
16. Measuring and Fitting
17. Tapers and Dovetails
18. Shop and Drawing Room Standards
19. Wire Gages and Stock Weights
20. Horse-power, Belts and Shafting
21. Metals and Other Materials
22. Machine Forgings
23. Knots and Slings
24. General Reference Tables
25. Automotive Data
26. Railroad Shop Data
27. Shop Trigonometry
28. Dictionary of Shop Terms

JUST where can any worker find as much and so wide a variety of helpful material as is given in this well-planned and well-organized handbook? Just think of being able to find the answer—the *right* answer— to any question —*quickly*—layouts, speeds, feeds, tools, jigs, fixtures, materials, standards, tolerances—any detail of machine-shop or drafting-room practice. In one handy, compact volume this Handbook fills all your reference needs.

Helps you with other men's experience

It is impossible to more than suggest the scope of this edition. The whole shop field has been combed for the best, most useful information on the problems that arise in every type of shop or plant, whatever its size, whatever its special problems. A great deal of the material comprises data and methods developed during wartime production and now being used and improved by leading manufacturers. Here are facts and figures on many different materials, practices and processes, effective substitute uses, pointers on machining special metals, and methods for difficult operations in drilling, grinding, punching, etc.—hundreds of kinks and short-cuts you can readily adapt to your machine-shop work.

Look up in this edition:

- latest data on wire measurement of screw threads—specifications for wires for satisfactory fits in mass production
- 38 pages of new material on screw threads, with many new and revised tables for American Standard threads—data direct from the Bureau of Standards in Washington
- new standards for truncated Whitworth threads brought out during the war
- up-to-the-minute material on new methods, in cutting and forming aircraft sheet-metal work
- extensive section on milling practice, with latest research data from leading makers of milling machines and cutters

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—wire method of measuring pitch diameter of taper pipe threads
—data on bevel gear systems from the Gleason Works
—speeds and feeds for tungsten-carbide tools
—latest information on highspeed or hyper-milling
—up-to-date data on negative rake angles for cutting steel, with details on care of cutters
—calculations for circular form tools
—thread lobes for screw-machine cams
—the Guerin process for cutting and forming sheet metals
—suggested cutter angles for turret lathe work
—adaptation of older machines to use of carbide tooling
—plastics used in forming dies
—procedure in atomic hydrogen welding
—advantages of glass gages
—recommended substitute steels for materials containing nickel, chromium, and vanadium
—use of the Aero screw-thread system
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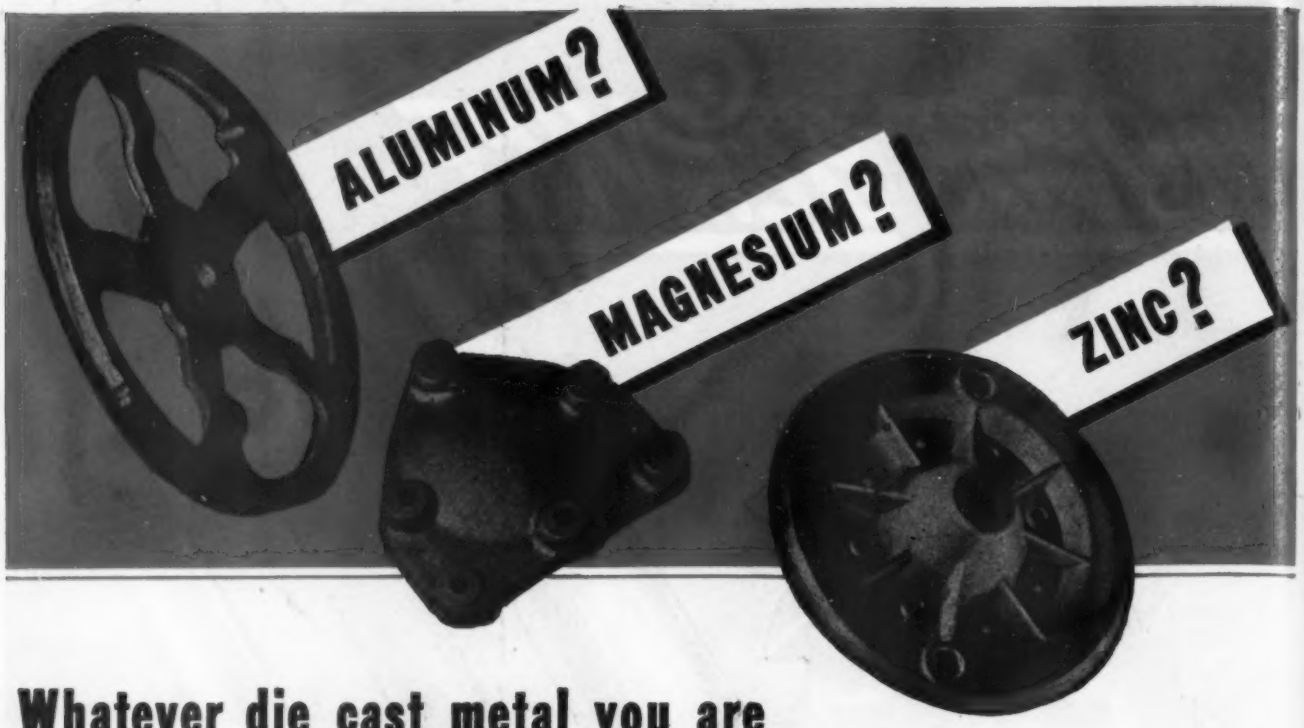

Whatever die cast metal you are using...thorough, low-cost Oakite cleaning will successfully prepare surfaces for subsequent finishing!

WHETHER you are using die cast parts of aluminum, magnesium, zinc or other alloys for war or civilian products, some type of finish for protective purposes or sales appeal is generally applied to parts. This finish may be organic, chemical or plated. But the results you obtain and the adhesion of the finish is largely dependent on the THOROUGHNESS of preliminary cleaning and surface preparation. Right at that point is where long and successful Oakite experience can help you keep costs and rejects down and improve the final finish.

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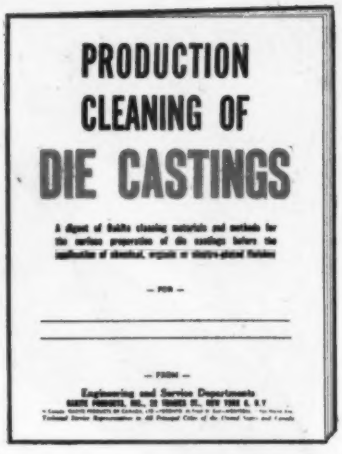
PRODUCTION CLEANING OF DIE CASTINGS

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— FOR —

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Digest describes 10 different methods of cleaning aluminum die castings; 8 methods on zinc; 3 methods on magnesium. Digest also includes methods of surface preparation for antimonial lead, brass, bronze, copper alloys, white metal, etc.

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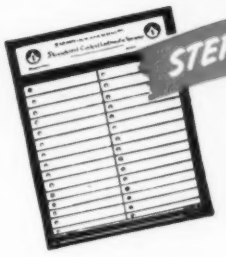
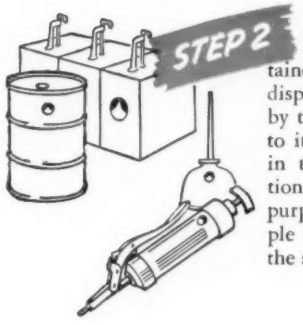
Get off to a good start with a sound lubrication plan

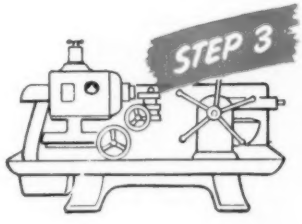
These three steps illustrate just how simple it is to install:



Each lubricant used in your plant is assigned a number. These numbers are recorded on a lubrication chart – this is the only record-making that is ever needed—and copies are kept in the oil room, purchasing department files, or wherever else they may be useful.



The lubricant in each storage container—barrel, drum, or dispenser – is identified by the number assigned to it. Numbered decals, in two color combinations, are used for this purpose—another example of the simplicity of the system.



All points lubricated in your plant are also marked with a numbered decal indicating *what* lubricant is to be used, and *where* it is needed.

SO 1 CO **CODED** SO 2 CO **LUBRICATION**

NOW THAT *economy* of operation comes to the front, the savings you can make in maintenance, repairs and lubricating time through Standard Coded Lubrication Service are of greater importance than ever. Standard Coded Lubrication makes these savings because it gives greater assurance of always getting the *right* lubricant in the *right* places. Regardless of how carefully you have selected various lubricants for various jobs, they must be applied where they are needed *every time.*

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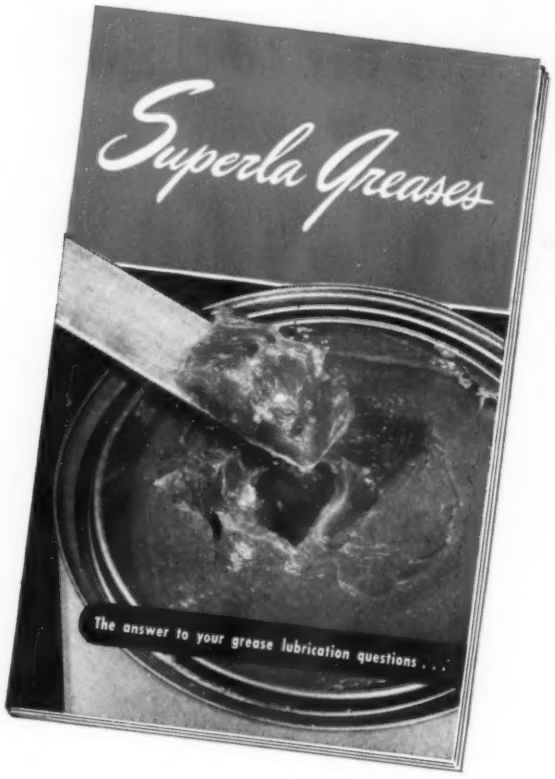
Can replace many special, premium priced greases on a wide range of applications.



SUPERLA GREASES in your plant will simplify your lubricating problem. This line of greases, in two types—Superla Numbered Greases and Superla "X" Greases—will handle most anti-friction bearing lubrication jobs—from low to high speeds and low to high temperatures.

In many instances, Superla Greases have replaced special greases and thus have simplified the job of ordering, stocking, and applying lubricants. This advantage of wide application is the result of combining many grease qualities in one line of high-grade lubricants. You can find out what these qualities are and what they mean in better lubrication by getting the booklet illustrated. In applying these greases to your particular job you can get valuable help from a Standard Oil Lubrication Engineer. You can reach him through the nearest Standard Oil Company office.

Send for a copy of this booklet

It describes the characteristics of the various grades in the Superla Grease line and suggests applications. Simply write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, for your copy.

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The "JO-BLOCK" Guards the Jewel of Accuracy

Right now, with the long-hoped-for post-war battle for business getting into full swing, the establishment of high standards of shop accuracy becomes all-important in thousands of plants.

Don't let the hurry of reconversion sidetrack this basic precaution. Protect the performance of your product—make assembly easier—provide parts interchangeability—with genuine Ford Johansson Gage Blocks.

Guaranteed accurate within .000002, .000004 or .000008 of an inch, plus or minus. Available in sets or individual blocks, with all accessories needed to establish and maintain true accuracy in your plant. Write for new Catalog No. 17 today.

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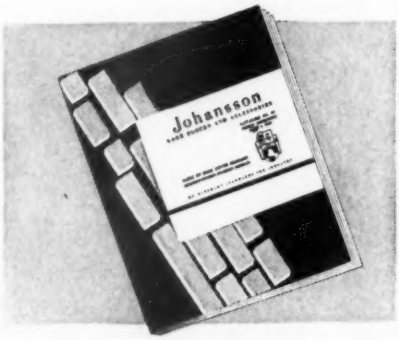

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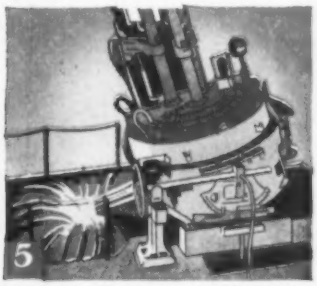
What will they cook up next?

You make alloys by "cooking" several metals together.

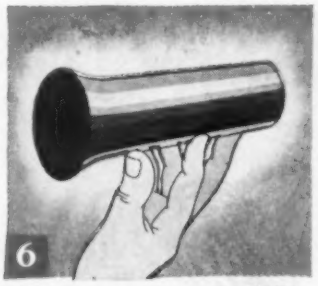
For example, you go to Africa and dig up some rare ore.

Then, you zip over to Turkey and dig up another kind . . .

. . . **and push off** for India for a third type. Next . . .



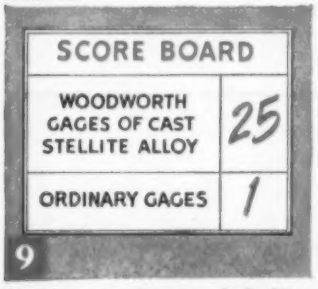
. . . **you mix 'em** exactly right and cook 'em in an electric furnace.



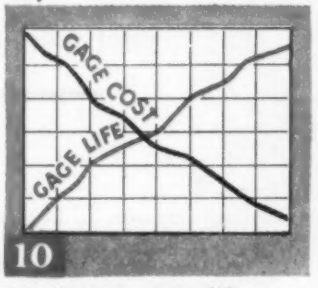
What have you got? STELLITE! A wonderful, useful new alloy.

N. A. Woodworth and Stellite engineers put their heads together.

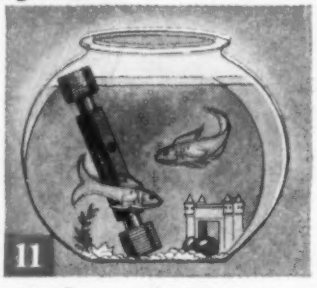
Result! Long-wearing and corrosion-resistant GAGES.



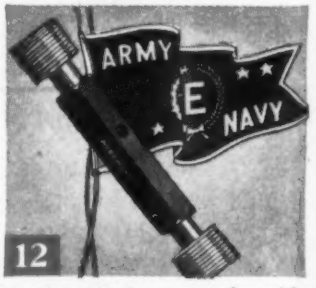
Woodworth Gages of Stellite Cast Alloy *outwear steel 25 to 1.*



They increase gage life many times—reduce gaging costs.



And, *they won't rust or corrode,* in storage or in use.



Woodworth Gages made with Stellite set production records!

What Woodworth research means to industry

PIONEERING in the use of splendid new materials like Stellite is almost an everyday occurrence at Woodworth.

Here's why.

Every Woodworth product must conform to this basic research and manufacturing policy . . . *to make only products which will benefit industry through increased production and reduced costs.*

Since Stellite makes certain Woodworth products more efficient, it is being used. But, if tools and gages made out of *fragments of the moon* were required to speed up production and lower costs, our engineers would strive to find a way to furnish them.

Our always-try-to-make-it-better attitude should be of real help to industries preparing for the coming scramble for post-war markets.

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Compressed Air has an inherent urge to be free . . . to escape from the confinement of a storage tank, or pipe, or the cylinder of a machine.

To attain freedom, *Compressed Air* will expand and push until all of its energy has been expended or released. This is *compressed-air power* at work. Engineers apply it to make man's work easier, better, and more productive.

Compressed Air pushes pistons or the blades of wheels to exert its power in air tools, such as drills, riveters, wrenches, hoists and rock drills. It operates air brakes, the switches and signals in railroad yards, and the controls of complicated processes . . . clamps the jaws of chucks in machine tools. It "fires" torpedoes from their tubes, operates their controls, and spins their gyroscopes.

Compressed Air supplies oxygen for combustion in oil, gas, and coal furnaces and boilers on land and sea. It is essential in blast furnaces and foundry cupolas.

Compressed Air creates powerful streams or blasts of air when it is suddenly released. These create waves of sound for whistles . . . hurl particles of sand for smoothing metal castings . . . spray paint . . . carry huge quantities of grain through tubes . . . scavenge and cool the barrels of naval guns.

Compressed Air expands as it tries to obtain freedom, inflating tires, displacing water ballast when a submarine surfaces, and raising sunken ships. It bubbles through liquids to pump by "air lift," and to agitate them.

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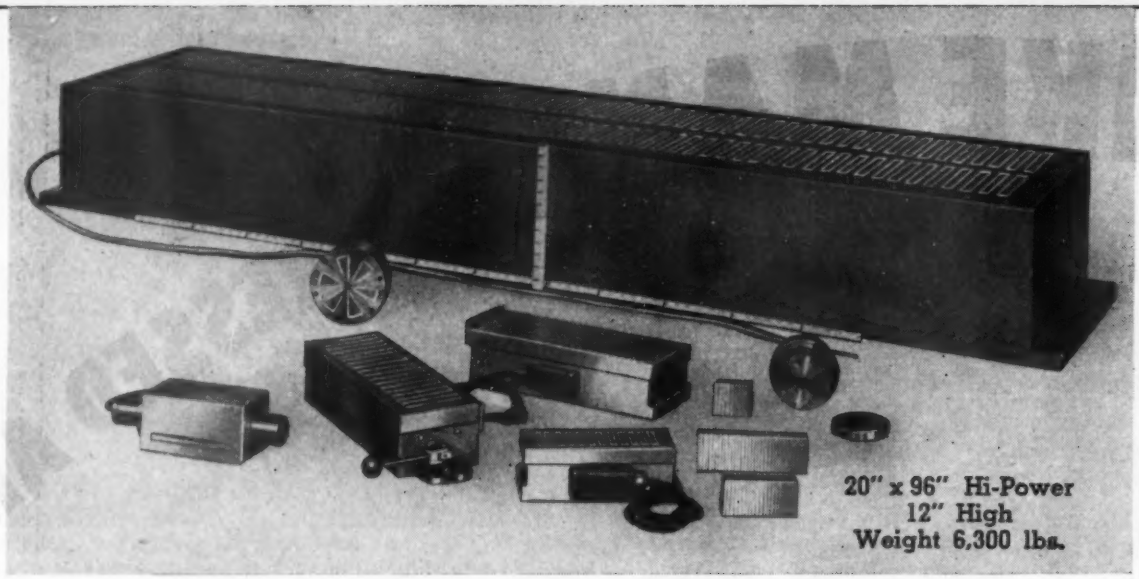

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- Increase your Productive Efficiency by the use of WALKER MAGNETIC CHUCKS.
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- Submit your problems to WALKER engineers for successful solution.

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Makers of Rectangular, Swivel and Rotary Magnetic Chucks. Also Permanent Chucks.

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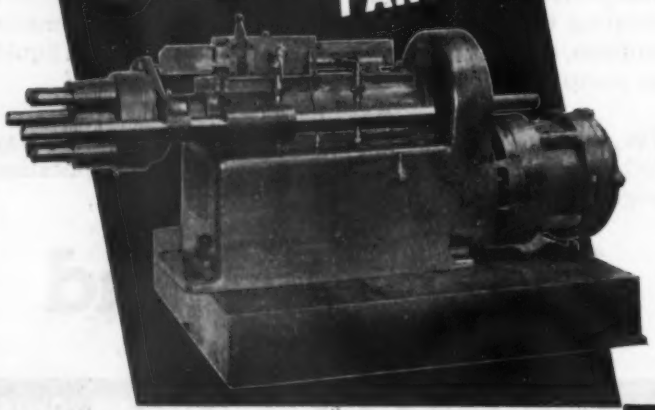
4 SPINDLE HOEFER HEAD ELIMINATES SEPARATE HANDLING OF AN UNWIELDY PART . . .



• A 5 h. p. Hoefer Hydraulic unit on which is mounted a 4 spindle HOEFER Head carried on guide bars. Tied into the fixture through a mounting bracket the head became a part of a large Ingersoll Multi Station Boring Machine performing operations on a tractor crank case. The four holes are at a 30° angle to all other operations and are done during the time of the other operations. The control is hydraulic, automatically starting our unit with its four spindle head by the index plunger of the trunnion entering its bushing. In this way a separate handling of an unwieldy part was eliminated and the extra jig for these holes was not necessary.

In our more than thirty years of concentrated effort in designing and building Multiple Spindle Heads we have produced this equipment for unlimited applications and in designs of every conceivable construction.

If you have a multiple drilling problem, the chances are we have furnished a multiple spindle head for similar use. Our engineering department is ready to work with you now to determine the right head for your job.

Hoefer's Whole Business is Holes . . . .

HOEFER MFG. CO. *Freeport, Ill.*

TOOL UP with TECO and get

- More pieces between grinds.
- More grinds per tool
- Less down time
- Lower tool cost

If you think your present carbide performance is "satisfactory" . . . you've got a profitable surprise coming when you use TECO Cemented Carbide. For TECO stays on the job much longer—produces more pieces between grinds—than any carbide you've ever used, as hundreds of plant experiences prove daily.

Maximum resistance to wear and to breakage is the answer . . . obtained by combining the correct qualities of hardness, toughness and uniformity in every piece of TECO Cemented Carbide.

The proof is in your own plant. Tool up a machine or two with TECO for an on-the-job comparison. Then check the number of pieces and cost per piece. Our tool engineers are glad to discuss your needs. Send for catalog and price list.

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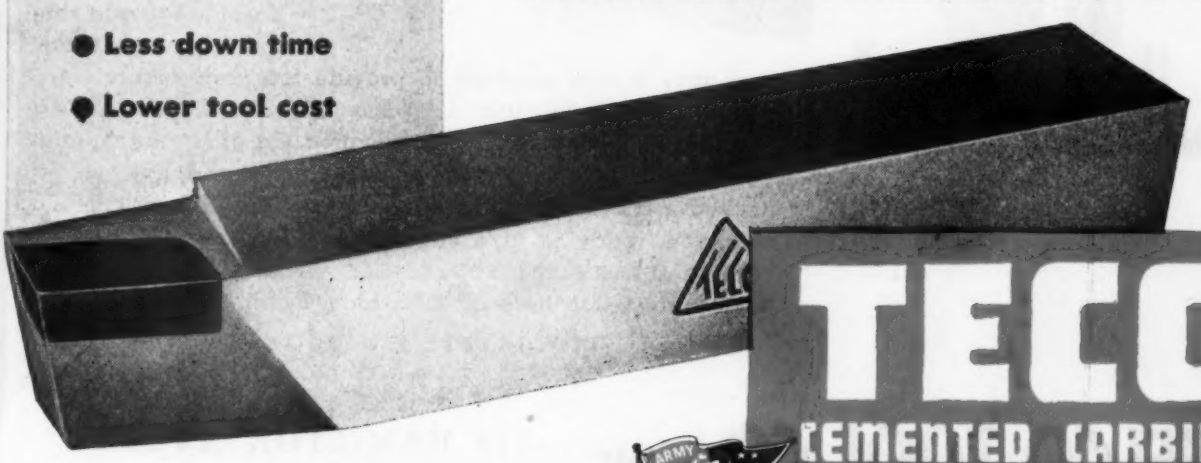

TECO

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Give the NELCO FIELD ENGINEER a few minutes time and SAVE hundreds of valuable PRODUCTION HOURS!

NELCO CARBIDE TIPPED MILLING CUTTERS

Designed for High Speed Milling

Specially developed and manufactured for machining all types of metals. Massive design, correct grade heavy carbide tips and special high tensile cast iron alloy bodies combine to provide top performance.

The successful use of Nelco Carbide Tipped Milling Cutters lies in their correct application. In order to acquaint you with these efficient, time-saving tools, and how to get desired performance, there is a NELCO FIELD ENGINEER near you, ready to give you first hand details. IT WILL PAY YOU TO LET HIM PAY YOU A VISIT. Write for an "on the job" demonstration of these new Carbide Cutters.

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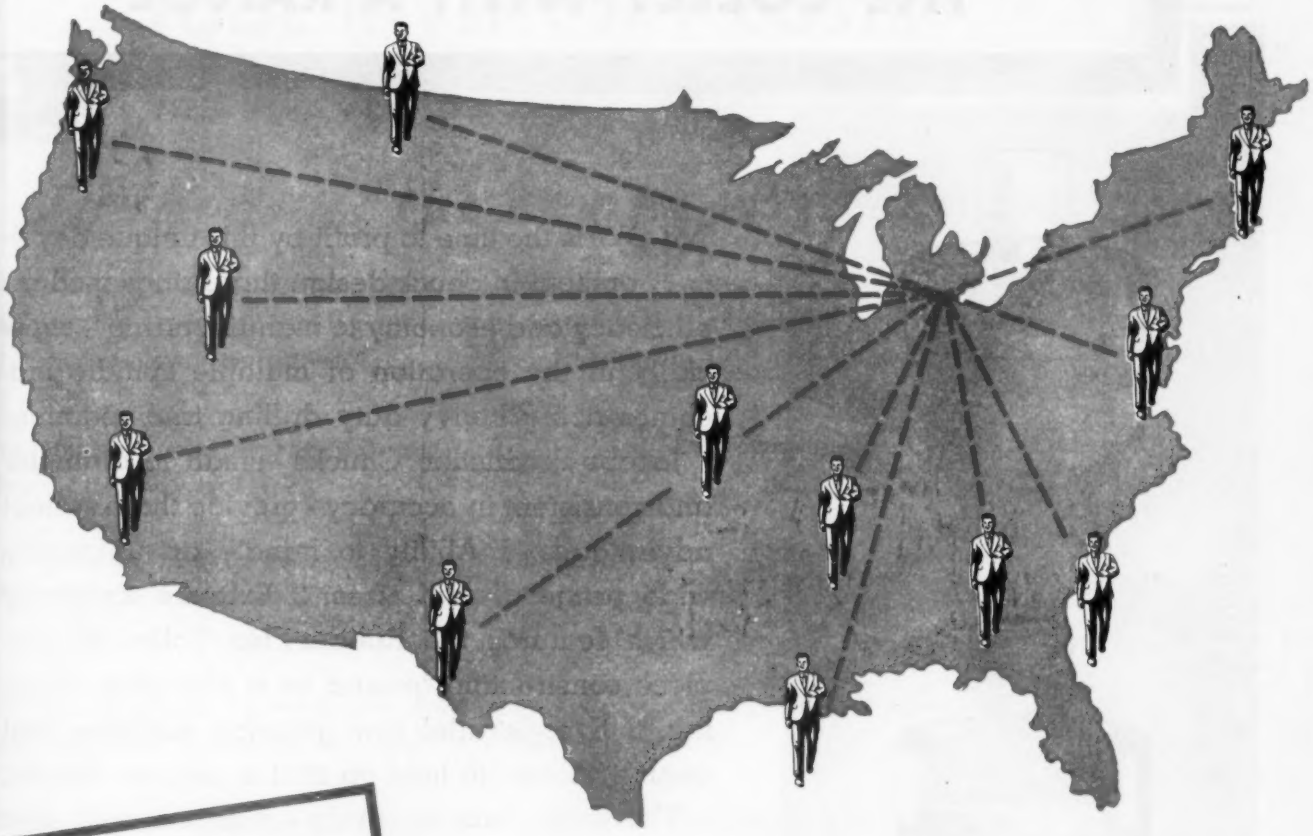

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Leading distributors in every section of the country have complete stocks of National Cutting Tools. Call your Mill Supply Distributor for National Cutting Tools or any staple industrial product.

NATIONAL SERVICE ENGINEERS are strategically located in every section of the country. These highly-trained specialists have had years of experience in dealing with all types of problems concerning cutting tools and their uses.

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NATIONAL

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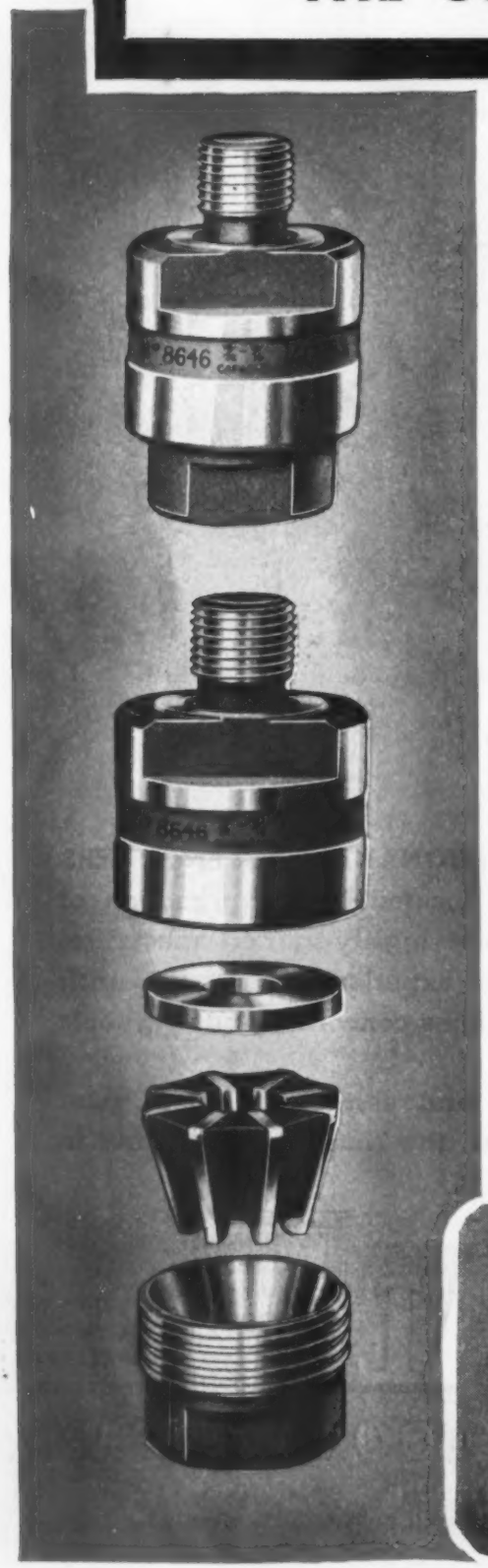
JACOBS PRODUCTION CHUCKS
with the RUBBER-FLEX COLLET
"THE COLLET WITH A RANGE"



NOW is the time to profit by this unique development in chuck design that brings modern efficiency and economy to manufacturing – especially in the operation of multiple spindle machines doing heavy duty drilling and reaming.

Jacobs Production Chucks – small in diameter and consistent in accuracy – provide three salient advantages: 1 Ability to handle an unusually wide range of drill sizes. 2 Extreme simplicity which features the Rubber-Flex Collet of one-piece construction ground as a unit after molding. 3 Ever-parallel jaw gripping surfaces that assure full-length hold on drill or reamer shanks.

The entire unit is sturdy – contains only four simple parts – stands unusual use and abuse without loss of accuracy or gripping power. The chuck socket receives the flatted tang of the drill and will take all drills having the same flat size. On most applications – because of the tenacious grip of the Rubber-Flex Collet – standard drills can be used without slippage!

12 OR 300?

12 Jacobs Production Chucks and 3 Arbors Cover More Than 300 Single Purpose Chuck Applications!

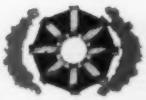
DESIGNED FOR POSTWAR ECONOMY
PERMIT DRASTIC REDUCTION IN TOOL INVENTORY COSTS

Featuring **"THE COLLET WITH A RANGE"**

Here's how the new design and construction principle of the Rubber-Flex Collet will bring substantial savings in tool inventory and operating costs and assure long-sustained accuracy to your machine operations:

The multiple jaws accurately spaced **in opposing position are made of hardened alloy tool steel.**

They are molded in a special compound of oil resisting **Neoprene and are internally and externally ground after molding.**

At rest, the Neoprene holds jaws parallel and ready to receive or to release  **the drill shank. It is now in the position of maximum capacity.**

When chuck is tightened the Neoprene is **displaced and the jaws close, gripping the drill shank firmly.**

At maximum capacity **jaws are always parallel and have a full length bearing.**

At minimum capacity, the jaw bites are still precisely parallel **and have a full length bearing.**

Write for Special Bulletin P1 today. The Jacobs Manufacturing Co., Hartford 2, Connecticut.

Jacobs Chucks

THE NATIONAL STANDARD FOR POST WAR PRODUCTION

PIONEER

With the development of modern precision grinders, The White & Bagley Company was pioneering and developing Economy Grinding Oils — the first special oils that will go down in history as materially assisting in the production of precision ground surfaces. In your plans for the future, the developments in the laboratories of The White & Bagley Company may offer a solution to your problems. It is not necessary to leave anything to guesswork — their experienced technicians are always at your service.

THE WHITE & BAGLEY COMPANY

WORCESTER, MASS., Detroit, Minneapolis

GROUND AND LAPPED FOR PRECISION KNURLING

REED KNURLS

More than 100 Different Styles and Sizes IN STOCK for Prompt Delivery. All Standard Knurls now available in either CARBON Steel or HIGH SPEED Steel.

Special Knurls made to your specifications

New Catalog 62 Sent Upon Request

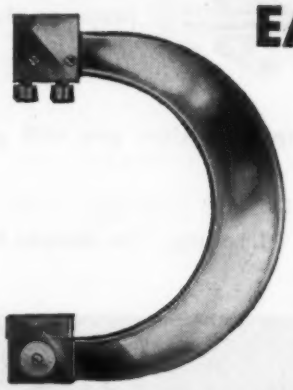
REED SMALL TOOL WORKS

WORCESTER 2, MASSACHUSETTS

Tubular

FEATHER TOUCH

SNAP GAGES

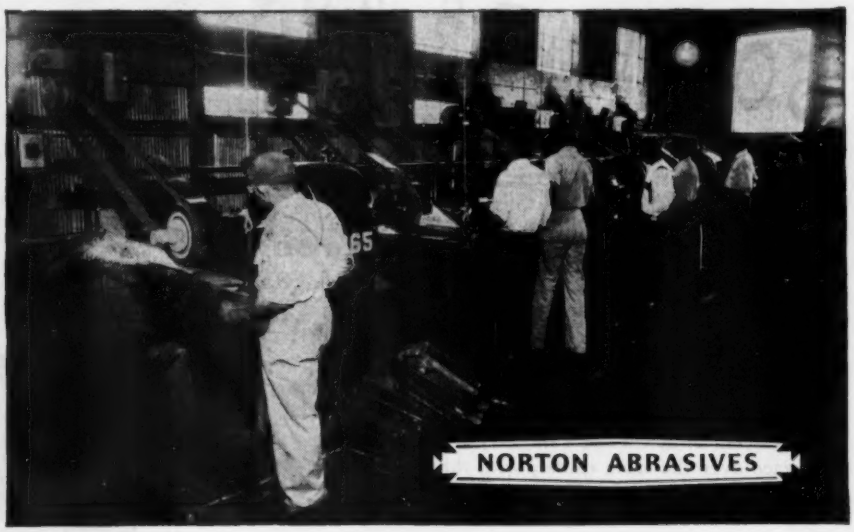


EASY to USE

TU-MI-CO TUBULAR FRAME of special homogeneous grain structure steel is 25 to 50% lighter than solid frame—yet highly shock resistant. Lessens fatigue. Hermetically sealed, low thermal conductivity, less expansion. Triple plated—copper, nickel and chrome, buffed and polished —an attractive, high quality precision tool.

TUBULAR MICROMETER CO., ST. JAMES, MINN., U. S. A.

"They shall beat their swords into ploughshares"—ISAIAH II: 4



★ SEE BELOW

SWORDS TO PLOWSHARES

Conversion to peaceful pursuits will bring its own battles—to do things better, faster, cheaper and with less labor.

But there's one modern, speedy, economical method that any metal working plant can so quickly and easily adopt:

Metalite Belts - Idler Backstands

. . . with the minimum expenditure of time and money and no loss of present floor space.

Just install an Idler Backstand behind your present lathe, substitute for the set-up wheel a resilient contact wheel, slip a Metalite Cloth belt over the latter and the pulley on the backstand, and you're off to higher speeds, better finish and sweeping reductions in "cost per piece sanded."

The examples shown in our illustrated bulletin give far more convincing details than we can possibly include in this short text. Just a few lines on your letterhead asking for "Plus Factors" will bring it by return mail.

★ Left: Grinding Machete Blade. Right: Finishing Plow Points.

Maximum CUT Minimum COST QUALITY ABRASIVES

BEHR-MANNING · TROY, N. Y.

(DIVISION OF NORTON COMPANY)

QUALITY COATED ABRASIVES SINCE 1872

50 YEARS AGO

the first automobile race

On Thanksgiving Day, 1895, the first automobile race ever run in America started from the building now housing the Museum of Science and Industry in Chicago. This event started the great race of industrial progress in America—a progress which has been paced by the dynamic automotive industry.

To commemorate this Golden Jubilee of the automobile, the Museum of Science and Industry will recreate this race over the same course, with the same type cars. The time—Thanksgiving Day, 1945.

Industrial Progress

MAKES AMERICA GREAT

AN important contributing factor in the production of more and better things for better living has been the development in the use of cutting fluids and specialized lubricants. Thirty years before the first automoble race, the D. A. Stuart Oil Company began furnishing industrial oils to American industry. And ever since, this company has devoted itself exclusively to the job of making better cutting fluids and helping industry use them to greatest advantage. This long, valuable background, as well as the latest experience resulting from Stuart's close integration in the war production program, is at your service. In your plans for future progress, the Stuart organization would like to help you use cutting fluids to the best advantage. Invite an engineer to call on you. Write D. A. Stuart Oil Company, Limited, 2729 South Troy Street, Chicago 23, Illinois.

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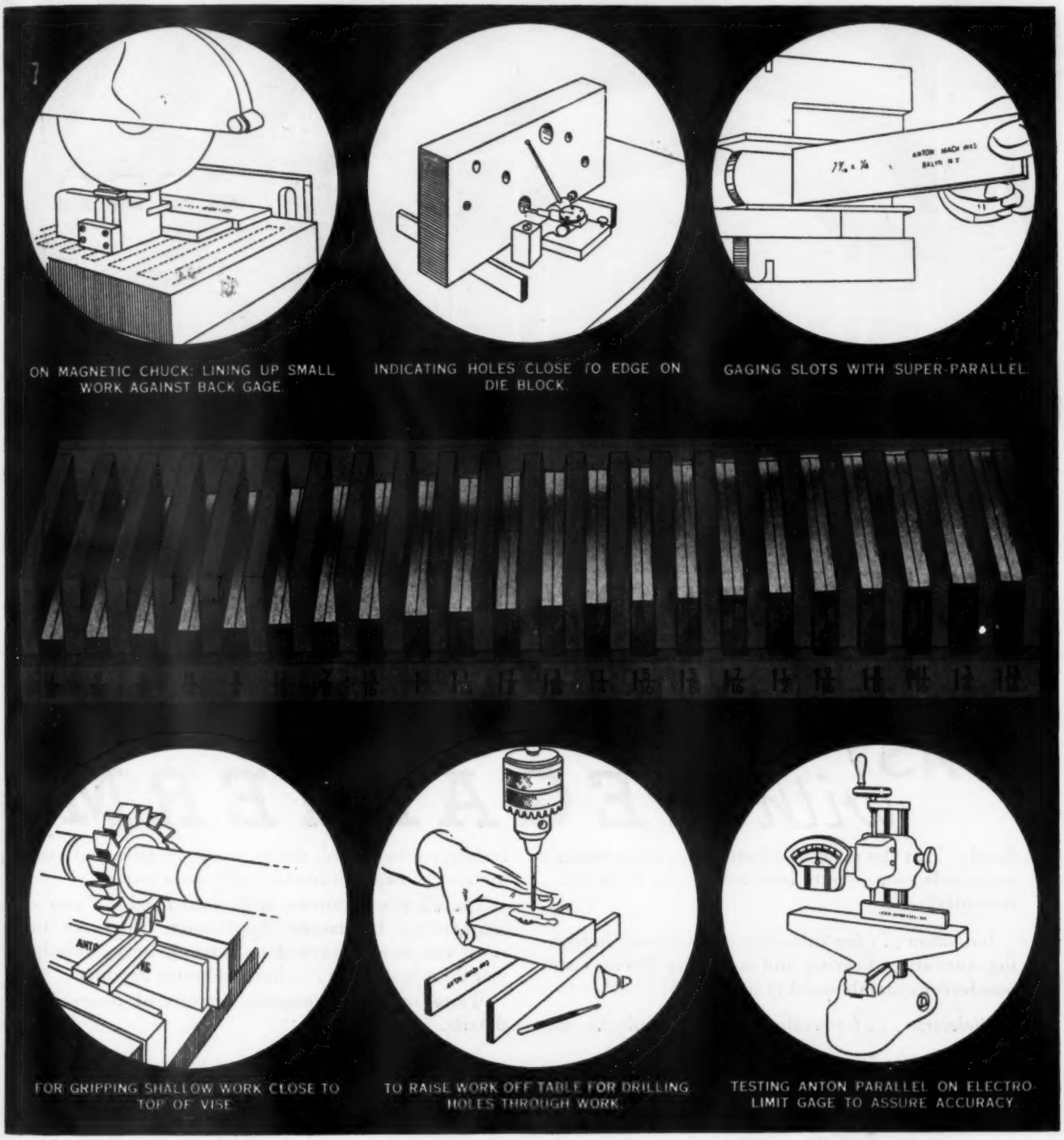
● PERMANENTLY STRAIGHT AND ACCURATE

● PRICE FOR COMPLETE SET.....$85.00

Using and Testing Anton Hardened Parallels:



ON MAGNETIC CHUCK: LINING UP SMALL WORK AGAINST BACK GAGE.

INDICATING HOLES CLOSE TO EDGE ON DIE BLOCK.

GAGING SLOTS WITH SUPER-PARALLEL.

FOR GRIPPING SHALLOW WORK CLOSE TO TOP OF VISE.

TO RAISE WORK OFF TABLE FOR DRILLING HOLES THROUGH WORK.

TESTING ANTON PARALLEL ON ELECTRO-LIMIT GAGE TO ASSURE ACCURACY.

Guaranteed ± .001 in size; ± .0001 in parallelism and straightness within length

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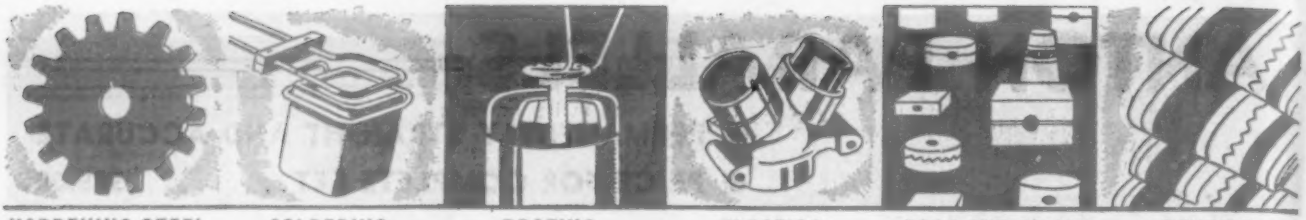
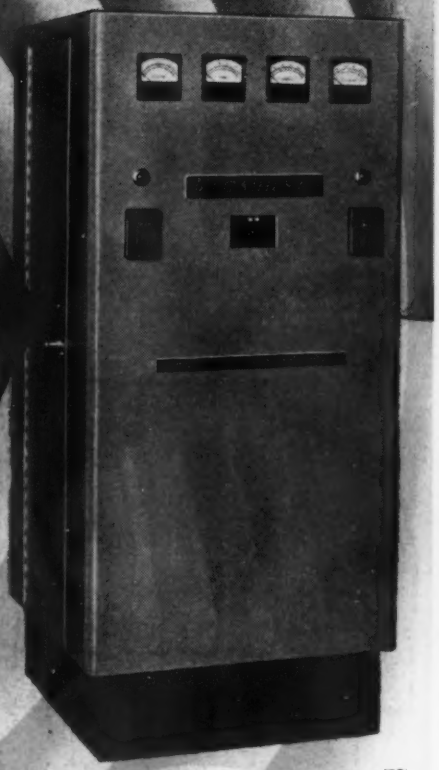


HARDENING STEEL | SOLDERING | BRAZING | PLASTICS | FOOD AND DRUGS | TEXTILES

heat

induction or dielectric



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There's a MEGATHERM to fit your need . . . and a MEGATHERM Electronic Application Engineer to show you how MEGATHERM electronic heat can help you do a better job . . . build a better product.

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3½" HOLES WITH *Speed* AND *Accuracy*

● Typical of the scope and versatility of CLEVELAND Twist Drills. A 3½" hole drilled in a duralumin aircraft landing gear box plate . . . on a production line drill press!

Whether drilling specifications call for holes .0135" or 4" in diameter, there are CLEVELAND Twist Drills to fit. For nearly three quarters of a century the ✧ trade mark has represented uniformly high quality and dependability.

Specify CLEVELAND Twist Drills, Reamers, Screw Extractors, Arbors, Mandrels, Sockets, Mills, Counterbores and Carbide Tipped Tools for all precision production.

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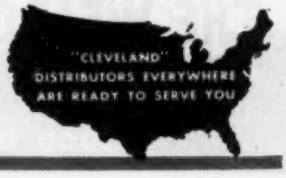

YESTERDAY'S PIONEER • • • TODAY'S LEADER

GROUND FORM TOOLS

In their extremely close tolerance and general high quality Weldon Ground Form Tools represent the culmination of many years experience in this special field. Weldon is fully equipped to produce form tools in any conceivable shape for all types of equipment necessitating the use of such special tools.

To take advantage of our complete service on this type of tool, from engineering to final production, all you need do is to outline your requirements. We'll do the rest.

Our present facilities insure prompt delivery.

Insist on WELDON TOOLS
FOR WELL DONE JOBS.

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THE WELDON TOOL CO. Cleveland 4, Ohio
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Get your data on PLASTICS from 102 commercial applications

—materials
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—properties
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The answers to your practical considerations on plastic materials and processes, in specific case studies of successful commercial products, covering every field of present-day use.

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185 *pages*, 7½ x 10½, 90 *illustrations*, $4.00

This book gives over a hundred case studies, each one vividly illustrating the use of a particular plastic or fabricating method. This is a book for engineers, designers and businessmen who want facts which have been successfully demonstrated in use. It is a book for men who want concrete answers to practical queries concerning a new material or process: What is it good for? Will it improve the product? Will it increase sales? Will it lower cost? Here, in accurate, understandable, and usable form, are the answers to these as well as a host of other pertinent questions on specific physical properties and mechanical considerations of materials.

This book gives you—

—a working knowledge of plastics
—an intensively-studied review of present and probable future uses of plastic materials
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—information on the place of plastics in your particular line of activity

● 102 detailed case studies describe how plastics have been adopted in answer to a series of specific problems.

● New developments in materials and processes are covered, including styrene elastomer, stripping coatings, jet molding, etc., and a critical evaluation of their effects on the use of plastics is presented.

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NEW! 16" DoALL ZEPHYR

for
PLASTICS
WOOD
HARD BOARDS
NON-FERROUS METALS & ALLOYS

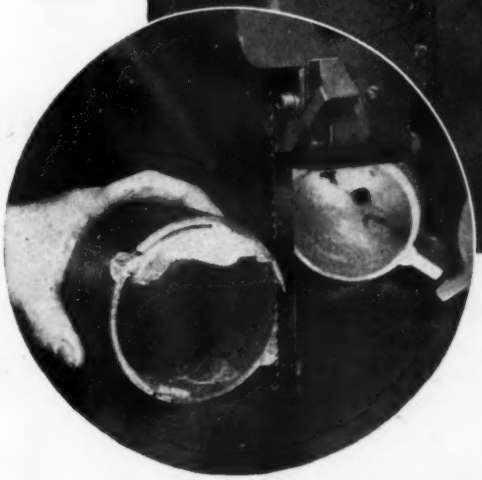
This versatile 16" Zephyr will take work up to 10" thick and cuts at any speed from 1000 to 5000 f.p.m. Meets the demand for greater speed in a compact housing—6½ ft. high, weighs 1150 pounds, and requires 33x41" floor space.

MAKES EVERY SECOND PAY

Operator consults Job Selector for proper saw and speed for the material he has to cut. He installs saw in a few seconds, adjusts fingertip speed control to specified speed and is off to a flying start.

ADVANCED FEATURES

Infinitely Variable Speed • Speed Indicator • Chip Blower • 4-way Tilt Table • 2 H.P. Motor • Other exclusive features make DoALL safe and easy to operate efficiently.



A demonstration can easily be arranged through the DoALL Supply Store nearest you—or, write for new catalog.

For high-speed cutting, use DoALL Buttress blades

BIG BROTHER OF THE 16" ZEPHYR, IS THE 36" ZEPHYR—BOTH INTRODUCE A NEW ERA IN BAND SAWING.

Baltimore	SA 5778	Dayton	HE 2738	Kansas City	HA 5857	Milwaukee	HO 5950	New York	MU 4-1514	Philadelphia	BAL 5850
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The DoALL Company Minneapolis 4, Minnesota

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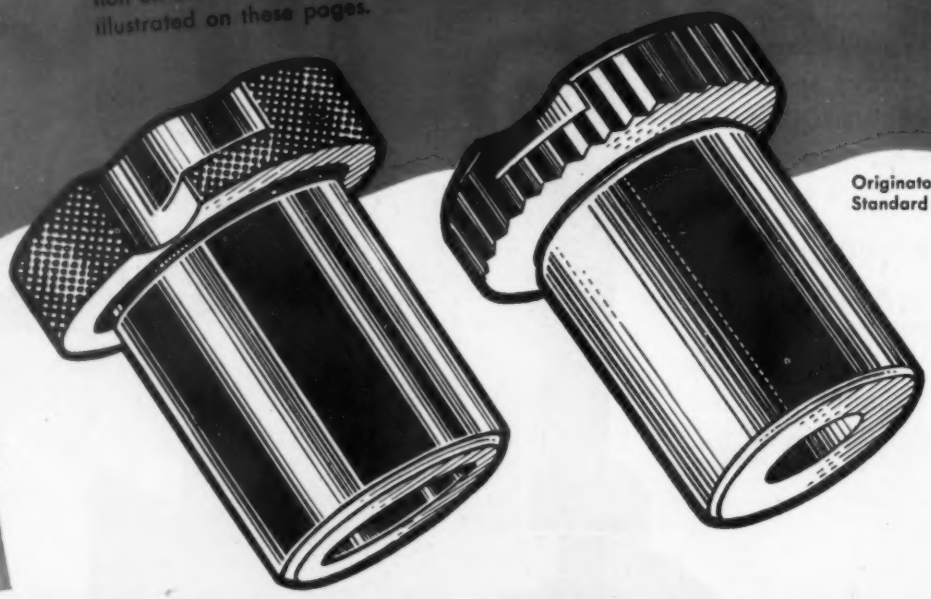
Their superhoned bores increase life of tools and drills

You are assured of more accurate, less costly drilling and reaming when you use Universal Drill Bushings. Their bores are precisely honed within extremely close limits of accuracy. Thus, they offer unexcelled resistance to wear and the galling action of chips. Straight and round to within .0003", they accurately guide tools. Knurled or serrated heads afford firm grasp for easy insertion or removal from jigs. Write for complete information on Universal Drill Bushings or any of the other superior Universal tools illustrated on these pages.



Originator of Standard Drill Bushings.

UNIVERSAL TOOLS THAT WILL INCREASE PRODUCTION AND ACCURACY IN YOUR PLANT

UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH, . MICHIGAN — Fighter Plane Given by Employees — 20% Employee Bond Deductions

Bowes Couplings

EXTRA-TOUGH RUST-PROOF FAST-ACTING

★ Universally preferred for over 35 years, Bowes Couplings are used on compressed air lines, and hose lines for gas, water, oil and liquids. Absolutely tight on pressures from 10 lbs. up, they are mechanically locked, and cannot be disconnected accidentally. A simple push and quarter twist connects, while a slight pull on locking sleeve, with a quarter turn, permits instant separation. The 6 styles shown are available in many sizes from ¼" to 1½" hose or pipe ends. Available in bronze or "Clevetrated" steel that resists corrosion.

BOWES COUPLINGS
for pressures to 125 lbs.

HIGH PRESSURE (VACUUM) COUPLINGS
for pressures to 1500 lbs.

These high-pressure couplings are unexcelled for forced lubrication systems as used in steel mills and other industrial plants. An exclusive feature is the use of balls in the couplings which produces two important advantages: In the first place, these balls insure absolutely tight locking of the coupling. Secondly, the balls reduce friction and center the male coupling in the female. Consequently, the two parts swivel freely even under high pressure. Made of steel, "Clevetrated" to resist corrosion. The Neoprene gasket is superior to ordinary rubber for this purpose.

BOWES AUTOMATIC VALVE COUPLINGS

★ These Coupling Valves, which mate with Bowes male couplings, are made in the 4 styles shown, in sizes of ½" and ¾". All styles have a *shut-off valve* which is open when connected with a male coupling, but automatically shuts off when disconnected. Styles IV and HV also have a second valve which automatically seats and shuts off the air if a break in the hose occurs between the valve and tool.

USE COMPRESSED AIR? Then write for Bulletin 78A—it tells all about Bowes Couplings and other Cleco Hose Fittings and Sundries.

THE CLEVELAND PNEUMATIC TOOL CO.

BRANCH OFFICES IN ALL PRINCIPAL CITIES

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KESTER FLUXES INSURE *Solder Performance*

Here's Why—

- Kester Fluxes are *scientifically compounded* to protect your product against solder failure! No matter what type of soldering—delicate dip-soldered electrical connections, sweating operations, or various types of seams—Kester makes the right and specific flux to prepare the way for tight, trouble-free solder bonds.
- For over 46 years, Kester has been the leading name in the field of solder. Kester fluxes of highest quality and unvarying uniformity, have been perfected through laboratory research and practical experience.
- For any solder problems you may have—consult Kester engineers. They'll gladly recommend the right flux to insure the lasting quality of your product . . . and at no obligation.

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Solder Fluxes
STANDARD FOR INDUSTRY

SAFE, UTILITY LEAD HAMMER

★ ALL WELDED
★ DOUBLE SHAFT
★ HEAD CAN'T CHIP

Improved design meets hundreds of tough jobs! New, durable head of virgin tellurium lead contains antimony — minimizes wear, danger from flying chips and splinters. Will not blemish contacting metal surfaces . . . Rugged construction—double steel rod shaft—cadmium plated to avoid rust — offers extra strength . . .Use with one or two hands. Expertly designed—in demand by skilled craftsmen everywhere. Head 5 lbs.—4¾"x 2"; Handle length 7"; overall length 16".

SURE-GRIP HANDLE: Durable plastic, serrated for positive grip. Safety bulge at end prevents hammer from slipping from hands.

NU PRODUCTS CO.
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HARDNESS TESTER

Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to HELL

Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.
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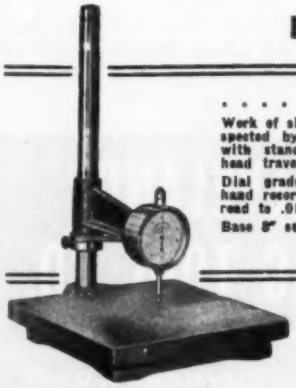
The RANDALL & STICKNEY Platform Gauge



. . . . *takes work up to 7 inches*

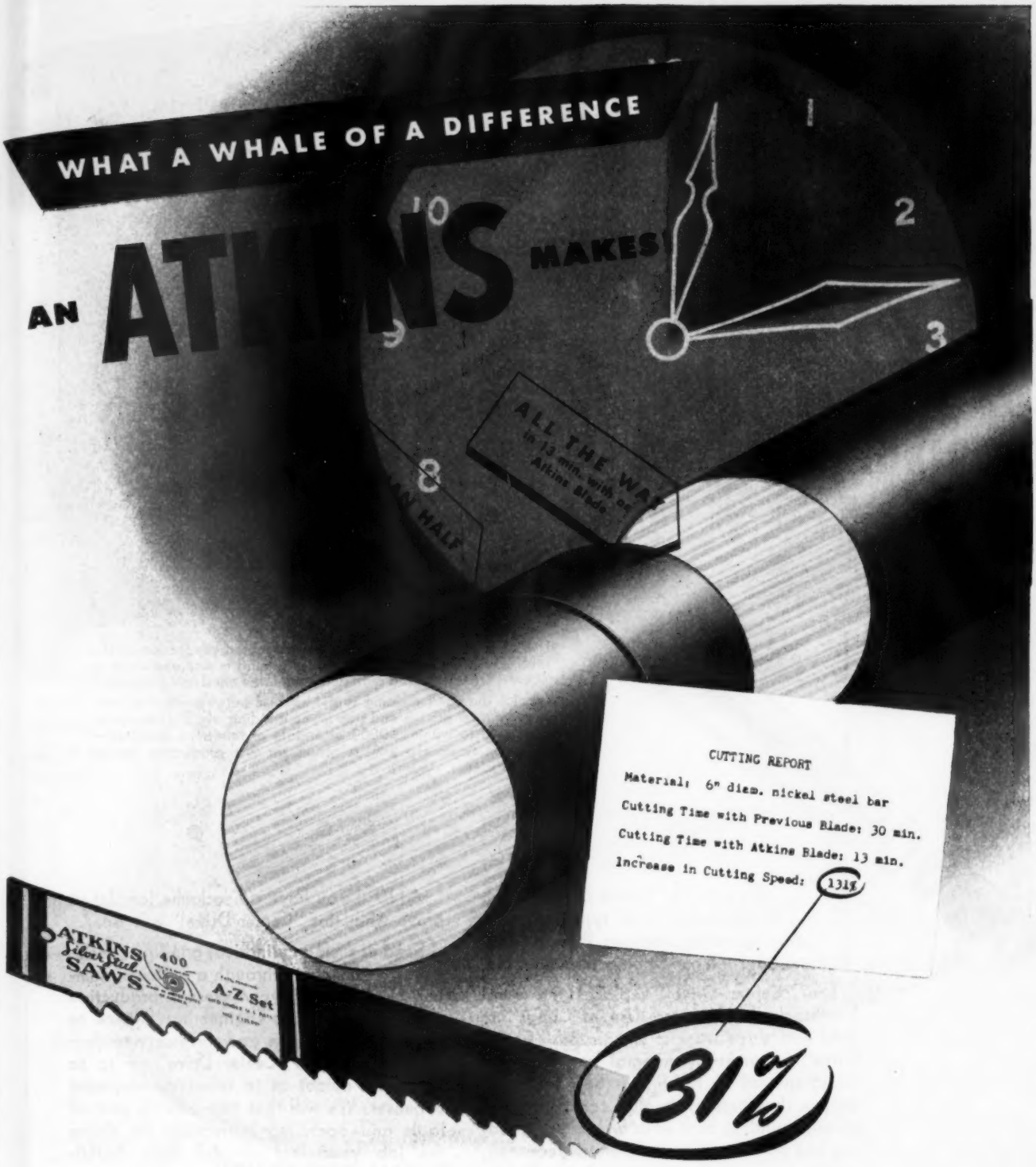
Work of similar size can be quickly and easily inspected by setting gauge head at desired height with standard block or plug. Spindle on gauge head travels ½".

Dial graduated 0 to 50 in thousandths; second-hand records 10ths of inches. Can be furnished to read to .01 mm.

Base 8" square; height 13"; weight 18½ lbs.

Investigate Now!

FRANK E. RANDALL CO.
Waltham 54, Mass.



This case of a 131% increase in cutting speed by changing to Atkins "Silver Steel" Blades is on the spectacular side to be sure. But along with scores of similar cases on record, showing comparable performance, it does prove that metal cutting deserves the closest inspection as a source of worthwhile production savings. Can metal be cut faster? . . . can more cuts be gained per blade? . . . can tool costs be reduced? These are questions our engineers are ready to help you answer with a positive "yes." Write us to have an Atkins Metal Cutting Engineer call on you.

E. C. ATKINS AND COMPANY
424 S. Illinois St., Indianapolis 9, Indiana
Agents and Dealers in All Principal Cities the World Over

ATKINS

Makers of Better Saws for Every Cutting Job
POWER AND HAND BLADES · MILLING SAWS · SEGMENTAL COLD SAWS · METAL CUTTING BANDS

Cut CYLINDRICAL GRINDING COSTS

Use of a "Center Drive" more than doubled production of this shaft. Entire piece was cylindrically ground in one operation as "Center Drive" rotated shaft and eliminated need for "dogging". Special diamond dressing tools, inserted between centers, produced proper groove and step in the grinding wheel. Dimensions were held to within .00003 of middle of tolerance specified—with approximately 2% rejection on first production run of 36,732 pieces.

• • •

by using a "Center Drive" which is adaptable to all types of cylindrical grinding machines. Plunge grinding production can be more than doubled.

The "Center Drive" replaces the usual headstock dead center. *Use of "dogs" to hold and drive work is eliminated.* "Center Drive" becomes an integral part of piece being ground — rotating it between dead centers, thus insuring absolute concentricity—permits grinding both ends of work, or grinding one or more different diameters, contours, angles and radii in a single plunge operation. Tolerances can be held to .00005 with practically no rejections.

Saves its own cost on first production run—AVAILABLE NOW.

AND if you have a headache job, let us prove what this "Center Drive" will do.

Send us such a cylindrical grinding "headache" — let us run through a sufficient number of pieces at your present production costs to permit our Engineering Service to develop a technique and necessary tools—built around the "Center Drive" — to so speed up output as to offset development expenses. We will then turn over to you all tools and operating instructions for doing the job yourselves — AT NO ADDITIONAL COST TO YOU.

Write, wire or phone us — let the "Center Drive" increase your cylindrical grinding PROFITS.

J. R. FISH RESEARCH & ENGINEERING CO.
SMALL TOOLS DIVISION

Our aim and intent—to provide an efficient world-wide organization to finance, develop, patent, manufacture-and market NEW IDEAS and inventions.

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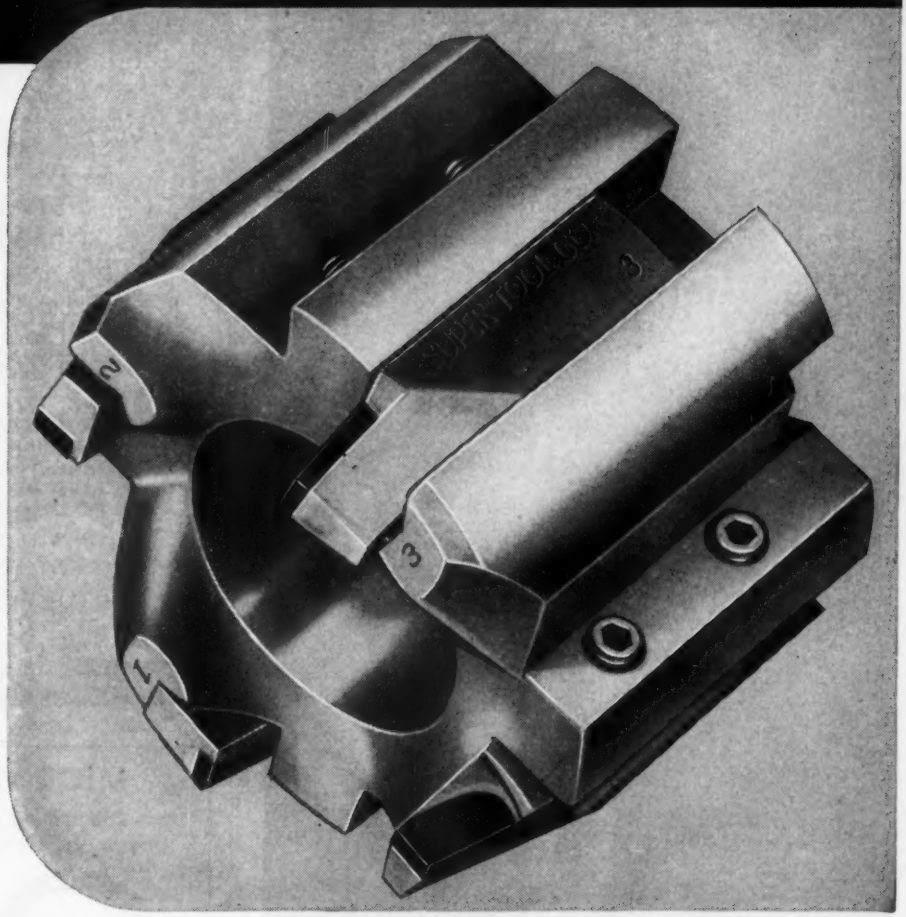
"STEP UP" YOUR STEP CUTTING PRODUCTION WITH SUPER'S NEW ROTARY BROACH TYPE CUTTER



FAST, ECONOMICAL STEP CUTS

This new Super Tool can be positioned for step cuts up to ½" or more, giving high rates of metal removal, assuring maximum use of carbide in milling performance, long life and simplification of grinding methods.

Simple to set up . . . sturdy body . . . adequate chip clearance . . . this tool is built to "step up" the tough production job.

LOOK FIRST TO SUPER Whatever Your Cutting Job

In addition to all types of special carbide-tipped tools, Super Tool Company manufactures a complete line of standard carbide-tipped bits, reamers, plain and side mills, shell end mills, face mills, end mills, counterbores, drills and centers. Specify Super Tools . . . Get Super Satisfaction.

IT'S A VERSATILE TOOL . . . Can be used for FACE MILLING

Super's Rotary Broach Type Cutter while designed primarily for step cutting can be used on many jobs where face milling is required. This is accomplished by setting the bits even on the peripheral cutting edges and face.

For the Finest Production Cutting Tools—Specify SUPER

SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Road, Detroit 13, Michigan ★ 4105 San Fernando Road, Glendale 4, California

ACCURACY

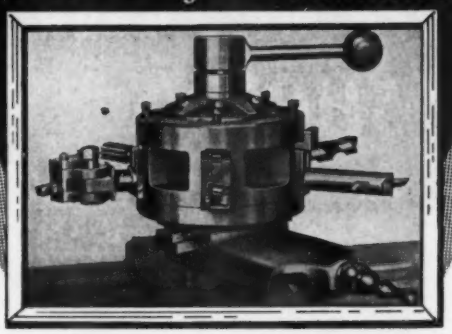
...a Degree of QUALITY

CRITERION *Boring* HEADS

Since, in this case, accuracy is a degree of quality Criterion Boring Heads rate very high. Especially noted for their accuracy, they also offer other superiorities. Lead Screw ground from solid AFTER hardening. Large offset adjustment. Interchangeable shanks. Sold everywhere. Ask your dealer. Request free literature.

CRITERION
MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

PORTRAIT *of* A TIMESAVER



5 STATION LATHE TURRETS ARE VITAL TO PRODUCTION

SAVE TIME

1. JUST A TURN AND A LIFT OF THE HANDLE BRINGS ONE OF FIVE TOOLS IN POSITION

2. THIS, WITH TEN ACCURATE INDEXED TOOL POSITIONS ALLOWS MINUTE ADJUSTMENTS

Time saved brings VICTORY that much nearer. Our NEW IMPROVED TURRET HEADS are built to take heavy cuts, and give precision service. Inexperienced help can quickly become fast operators with these NEW IMPROVED TURRET HEADS.

MADE UP IN FOUR INDIVIDUAL SIZES

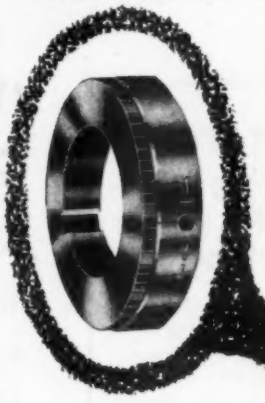
For Lathes From 9" to 30" Swing — Write Today for Details

AUTOMATIC MACHINE & TOOL CO. ENGINEERED PRODUCTS AUBURNDALE, MASSACHUSETTS

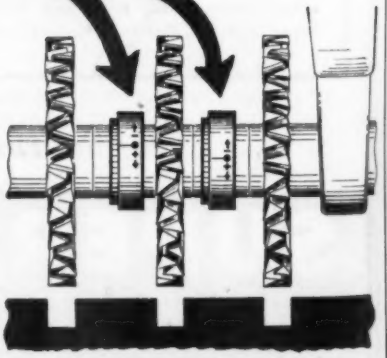
132 CHARLES STREET, AUBURNDALE, MASS.

MICROMETER ADJUSTMENT

on side milling cutters and gang milling setups with Dayton Rogers Micrometer Adjustable Spacing Collars



You can make an adjustment QUICKLY — ACCURATELY on all milling machine setups with these collars by merely loosening the cutter arbor nut and making an adjustment as required. Graduated in thousandths, an adjustment of .0005" can be made very readily by visual calibration.



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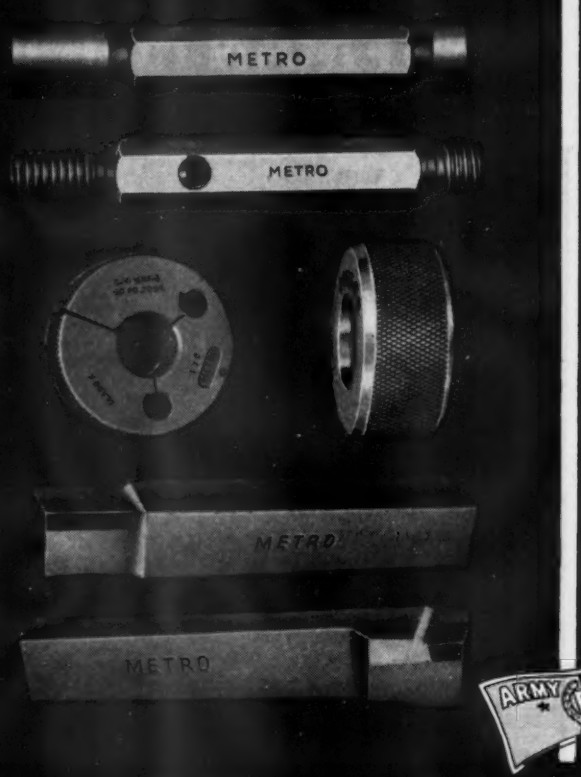

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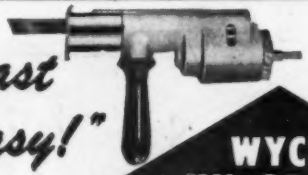

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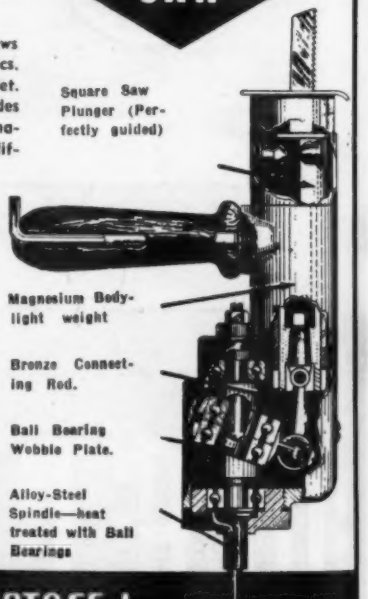
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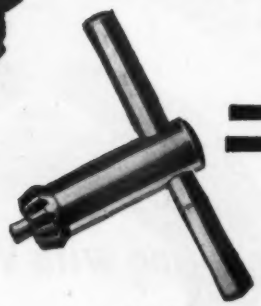

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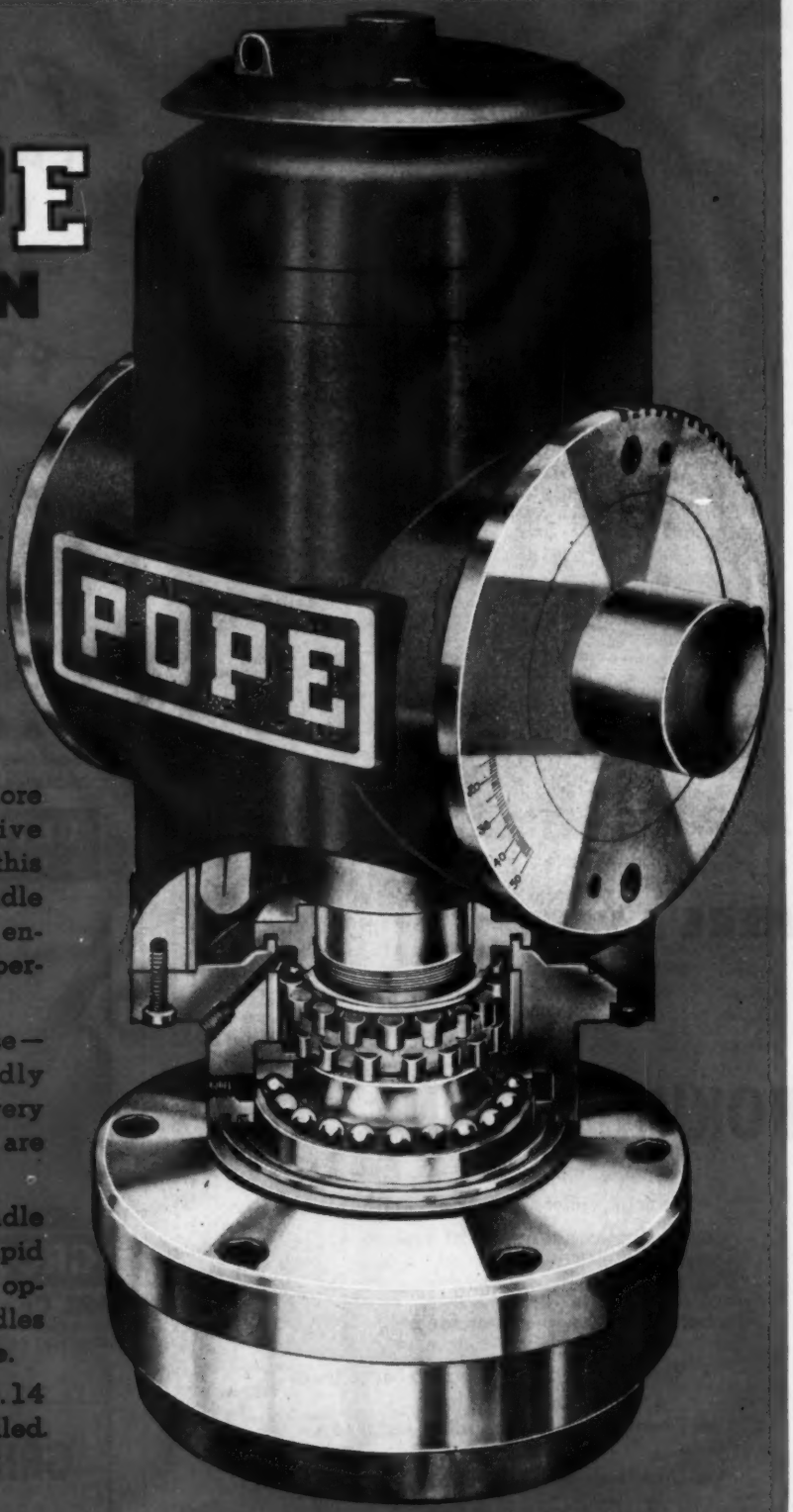

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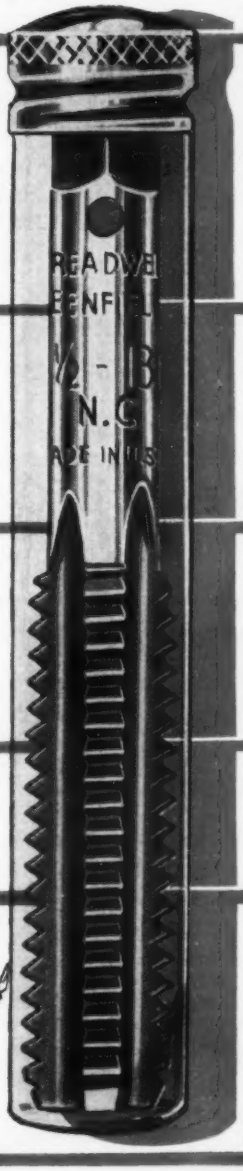

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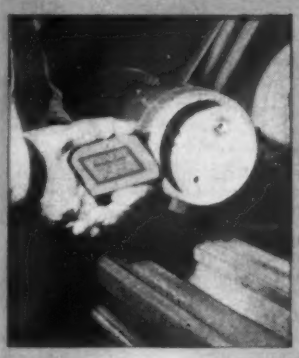

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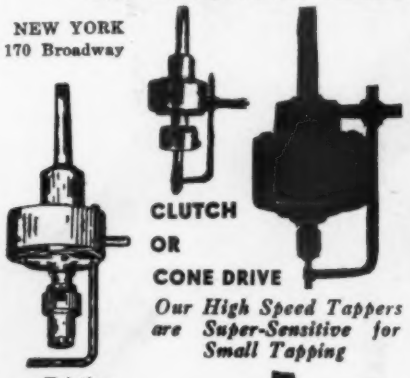

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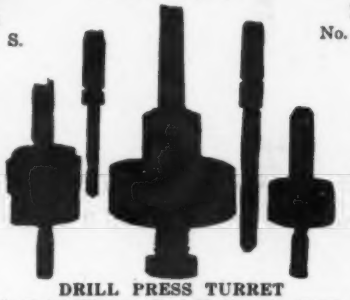

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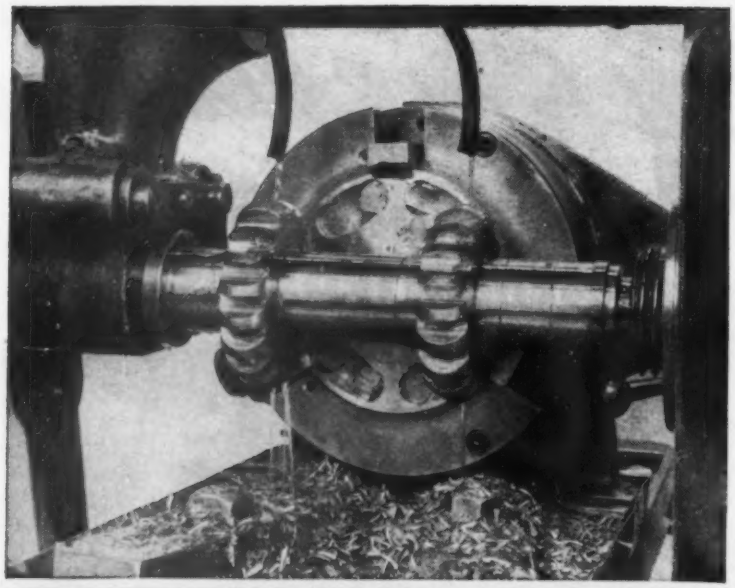


. . . Showing the VERSATILITY of the HARTFORD Super Spacer on Indexing Operations

THERE are so many indexing jobs which the Hartford Super-Spacer can do faster and more economically because of its versatility, that to investigate is to uncover new ways to save both time and money. Shown here is a setup which a manufacturer of aircraft engine parts applied to speed up rough milling and assure convenient handling.

The part shown is held by a quick-clamping fixture operated by a hand wheel at the back of the Super-Spacer. Indexing is accomplished positively and precisely in the usual way by means of the Standard Super-Spacer Master Index plate which is hardened and ground to assure accuracy. The Mask Plates provide correct, rapid, foolproof spacing.

As a basis for special fixtures, the Hartford Super-Spacer provides a substantial and accurate indexing foundation at a minimum cost. In all cases rigid control of spacing operations is assured, as proved in an almost unlimited variety of uses.

●

Send for literature showing applications to milling, drilling, slotting and jig boring.

The HARTFORD SPECIAL MACHINERY CO. *Hartford 5, Conn.*

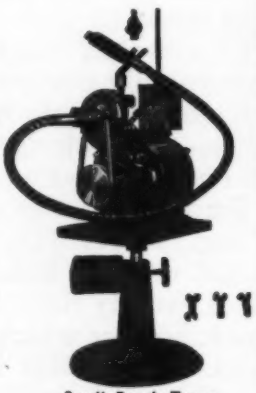
1905 **Strand** **1945**

FLEXIBLE SHAFT MACHINES

VERTICAL AND HORIZONTAL TYPES
⅛ to 3 H.P.

Swivel Yoke Types
¼ to 1½ H.P.

ONE HUNDRED TWENTY-FIVE TYPES and SIZES



Small Bench Types
⅛ to ¼ H.P.

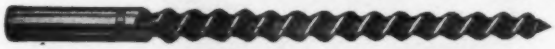
HIGHEST QUALITY MACHINES
HIGH SPEED STEEL ROTARY FILES . . . ROTARY CUTTERS

Send for our new 112 page Catalog No. 29

Largest Flexible Shaft Line in the World

N. A. STRAND CO.
CHICAGO 40, ILL. **5001 NO. WOLCOTT AVE.**

HOLMAN *BETTER, FASTER HOLE FINISHING*



HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

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MANCHESTER, CONN.

LUERS Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By
J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.
Produced under license issued by John Milton Luers Patents Inc.

D&T MICROMETERS AND SNAP GAGES

Tubular welded frames with forged ends insure a maximum of accuracy with a minimum of weight.

There are a variety of types available with either micrometer heads or dial indicators to cover a range of capacities from 0 to 168 in. . . *Write for Bulletin 200* or outline your gaging problems.

• D & T Bow Micrometer
0 to 6 in. capacity

Davis and Thompson Co.
Mfrs. of Machine Tools and Micrometers
6411 W. Burnham St. Milwaukee 14, Wisconsin

Headed your way—

THE NEW BLACK ARROW LINE

of Gas Cutting and Welding Apparatus. Black Arrow is the new, packaged line of high quality, precision-built Gas Cutting and Welding Apparatus. Products range from complete outfits through a broad selection of torches, tips, regulators, accessories and supplies. You'll hear more about Black Arrow from your local jobber—soon.

BLACK

THE BLACK MANUFACTURING CO.
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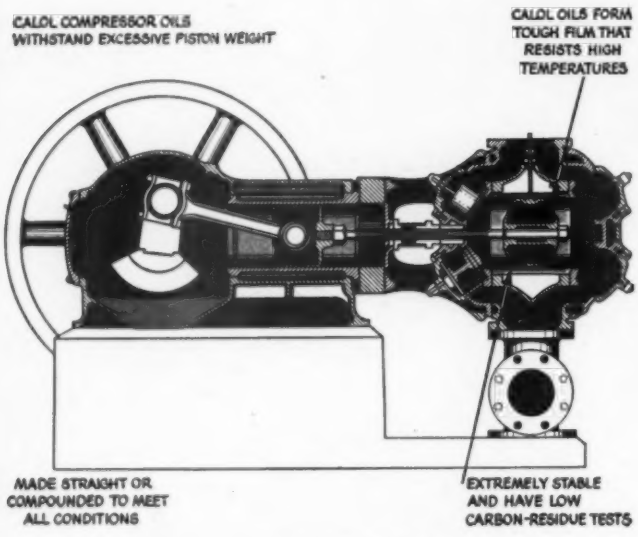
BALTIMORE 23, MARYLAND

FORMERLY THE ALEXANDER MILBURN CO.
PIONEERS IN GAS CUTTING AND WELDING APPARATUS SINCE 1907

STANDARD ENGINEERS NOTEBOOK

CALOL RPM


CALOL COMPRESSOR OILS WITHSTAND EXCESSIVE PISTON WEIGHT
CALOL OILS FORM TOUGH FILM THAT RESISTS HIGH TEMPERATURES
MADE STRAIGHT OR COMPOUNDED TO MEET ALL CONDITIONS
EXTREMELY STABLE AND HAVE LOW CARBON-RESIDUE TESTS

SINGLE-STAGE AIR COMPRESSOR WITH OIL-TIGHT CRANKCASE

Special oils up air compressor efficiency

Many operators have increased air delivery from compressors by lubricating cylinders with specially-made Calol Compressor Oils.

To meet both dry and moist operating conditions, in all type compressors there are two grades. Both withstand high pressures and temperatures.

Calol Compressor Oil—19 is a straight mineral oil. Pale in color, it is very stable and correctly lubricates under pressures up to 150 pounds per square inch.

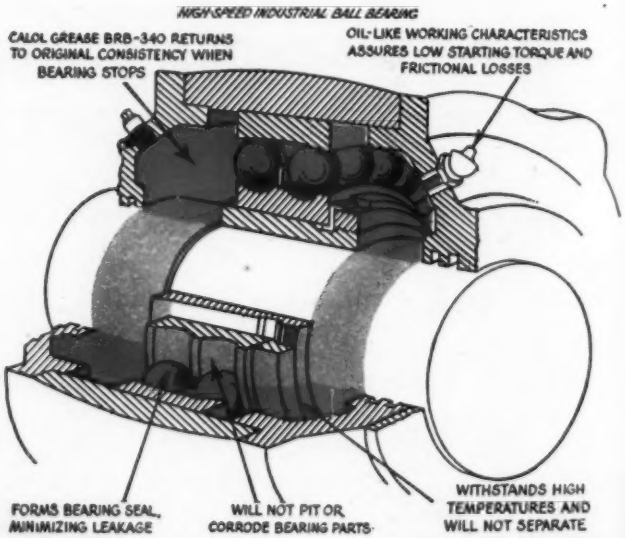
Calol Compressor Oil—19X is compounded and completely resists the washing action of moist air on the cylinders of machines operating in humid surroundings. It is particularly adaptable to large horizontal compressors, where piston weight is a factor, and to compressors on air-injection Diesel engines.

New Calol grease softens and resets

Where anti-friction bearings operate in severe conditions of temperature and speed, newly developed Calol Grease BRB-340 allows easy starting and reduces running friction to a minimum. At high shear rates, its apparent viscosity approaches that of its oil component. However, undue leakage from bearings is prevented by the peculiar ability of Calol Grease BRB-340 to reset, which causes the excess grease, swept aside by balls and rollers, to form a partial seal.

Calol Grease BRB-340 is soft, smooth and has a fine fibrous texture. It is milled by a special process that eliminates bleeding although it contains an unusual amount of oil stock.

When undergoing severe tests, Calol Grease BRB-340 showed no separation in a bearing operating 10,000 RPM at 200° F. for 528 hours. At the end of the test the bearing was in good condition.


HIGH-SPEED INDUSTRIAL BALL BEARING
CALOL GREASE BRB-340 RETURNS TO ORIGINAL CONSISTENCY WHEN BEARING STOPS
OIL-LIKE WORKING CHARACTERISTICS ASSURES LOW STARTING TORQUE AND FRICTIONAL LOSSES
FORMS BEARING SEAL, MINIMIZING LEAKAGE
WILL NOT PIT OR CORRODE BEARING PARTS
WITHSTANDS HIGH TEMPERATURES AND WILL NOT SEPARATE

There is a Calol Product to meet every industrial lubrication problem. For information, write Standard of California, 225 Bush Street, San Francisco 20, California.

FOR EVERY JOB A **STANDARD OF CALIFORNIA** TEST-PROVED PRODUCT

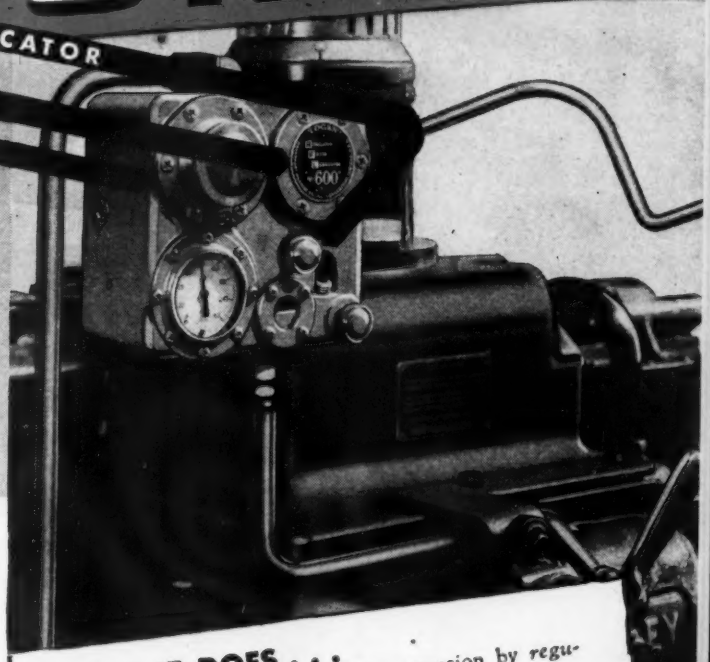
Minimize wear...assure full, fast-acting power and uniform actuation in all AIR-OPERATED equipment

...install the new

R-F-L AIR UNIT

EGULATOR ILTER UBRICATOR

by "LOGAN"



to provide UNIFORM AIR PRESSURE with FILTERING and AUTOMATIC LUBRICATION

● The Logan *R-F-L Unit* is a natural for your new, improved products. On all air-operated equipment, new or old, it will assure capacity performance and effect a marked reduction in wear. The R-F-L Unit levels out surges and sudden drops in the air supply, and keeps the working pressure uniform with minimum air consumption.

In a simple, compact unit, it combines all the elements of the awkward "Christmas tree" assembly of reducing valve, pressure gauge, air filter and lubricating device. All connections are built into this unit, eliminating piping and pipe friction. All elements are easily controlled from the front panel.

The clean lines of the Logan R-F-L Unit harmonize with the modern styling of today's industrial equipment. It can be mounted on a panel or in the air intake line. The complete unit measures 6" square by 4¾" deep. It is built for operation at pressures to 150 p.s.i.

WHAT IT DOES . . .

1. Provides smooth, full, uniform actuation by *regulating air pressure.*

2. Assures unfailing operation and reduces wear by *filtering air* to separate rust, scale, other foreign matter and water.

3. Protects working parts of cylinders, valves, tools, etc., against rust and corrosion, and minimizes wear with oil film *lubrication* (automatically injects a continuous oil mist into air supply).

HOW IT IS CONTROLLED . . .

2 knobs on panel accurately and quickly adjust air pressure and amount of oil injected as required by work. 3rd knob drains water trap. Complete visibility of air pressure gauge and oil supply level.

HOW IT IS INSTALLED . . .

In the air intake line from the main air line. Can be mounted on a central control panel (see illustration at bottom).

Free Literature . . .
Write for literature on the new Logan R-F-L Unit; also air cylinders and valves.

ENGINEERING ADVICE—Take advantage of the new R-F-L Unit on your products and in your plant. Ask Logan engineers for recommendations on complete air systems and equipment. Layouts furnished. No obligation.

Logan

SAVES ★TIME ★EFFORT ★MOTION

Air and Hydraulic Equipment

LOGANSPORT MACHINE CO., INC.

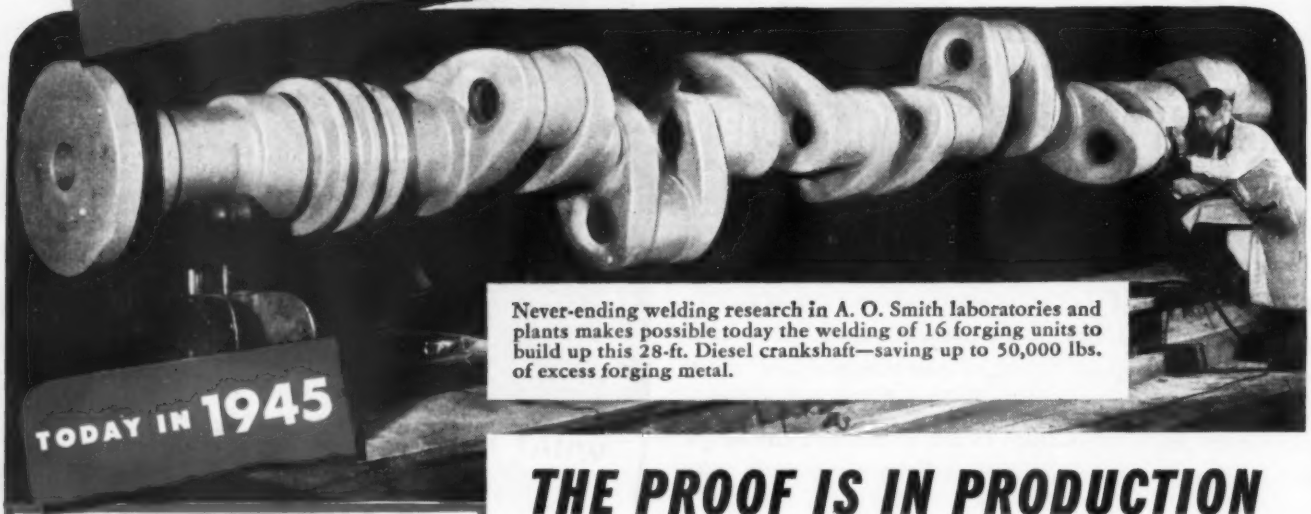
918 CENTER AVE. LOGANSPORT INDIANA

CHUCKS • CYLINDERS • VALVES • PRESSES • SURE-FLOW COOLANT PUMPS

RESEARCH BEHIND THIS 1918 AXLE HOUSING . . . . →

MAKES THIS CRANKSHAFT POSSIBLE TODAY ↓

Weld tensile strengths of 50,000 to 60,000 p.s.i. achieved with SMITHway-developed, paper-coated electrodes made it possible, in 1918, to weld longitudinally automotive rear-axle housings—a tremendous step forward in the relatively primitive art of welding.



Never-ending welding research in A. O. Smith laboratories and plants makes possible today the welding of 16 forging units to build up this 28-ft. Diesel crankshaft—saving up to 50,000 lbs. of excess forging metal.

THE PROOF IS IN PRODUCTION

Prior to World War I, welding electrodes were imported from England. When war brought shipping restrictions, A. O. Smith chemists and metallurgists developed a new and radically improved type of shielded arc electrode. They coated the bare wire with paper . . . produced welds of high ductility with tensile strength equal to that of rolled steel plate.

The SMITHway welding research and development that began in 1917 have never ended. They continue today in A. O. Smith laboratories . . . and in A. O. Smith plants, where more than 320,000 SMITHway Electrodes are used in actual production every day. Millions more are used by other manufacturers.

For detailed specifications on SMITHway Certified Electrodes and their application to specific welding jobs, send for the SMITHway Welding Catalog.

SMITHway WELDING ELECTRODES
Mild Steel . . . High Tensile . . . Stainless Steel
made by welders . . . for welders

Now . . . a Complete Line of **SMITHway A. C. Welders**

The expanded line of SMITHway A.C. Welders includes three new models of 150-, 200-, and 250-ampere capacity, in addition to the Heavy-Duty Models of 300-, 400-, and 500-ampere capacity. Write for complete specifications and prices.

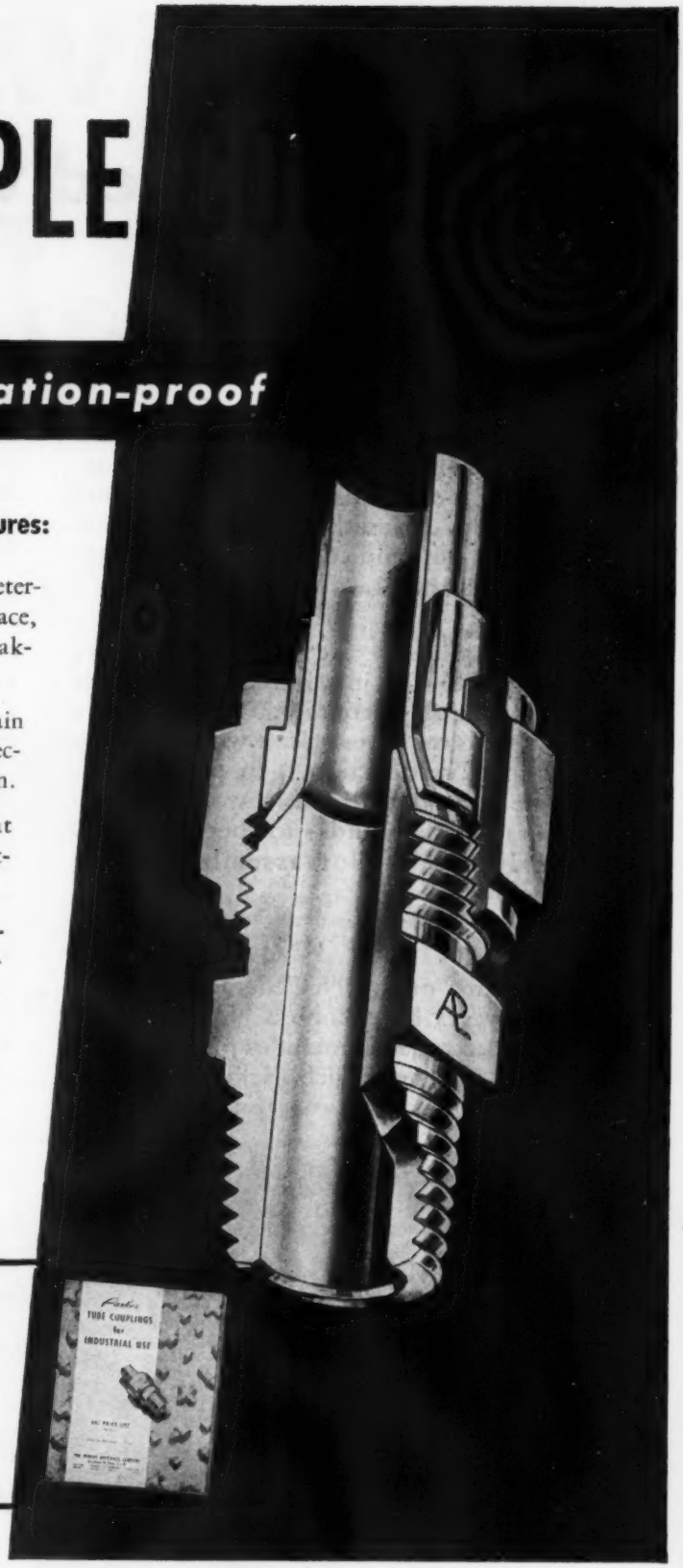
SMITHway Certified WELDING ELECTRODES

A.O. SMITH Corporation

NEW YORK 17 • PITTSBURGH 19 • CHICAGO 4 • TULSA 3
HOUSTON 2 • DALLAS 1 • LOS ANGELES 14 • SEATTLE 1
INTERNATIONAL DIVISION: MILWAUKEE 1 • In Canada: JOHN INGLIS CO., LIMITED

WHY THE PARKER TRIPLE

is leak-tight and vibration-proof



These are exclusive and patented Parker features:

1 The angle of the flare is scientifically determined, to provide maximum clamping surface, with equalized pressure all around—for a leak-proof connection that stands high pressure.

2 Body, nut and sleeve take all the stress and strain from the tubing and flare, and give full protection against the effects of shock and vibration.

3 Inside diameter of coupling is uniform with that of tubing—for streamlined flow—no obstructions or pockets to cause turbulence.

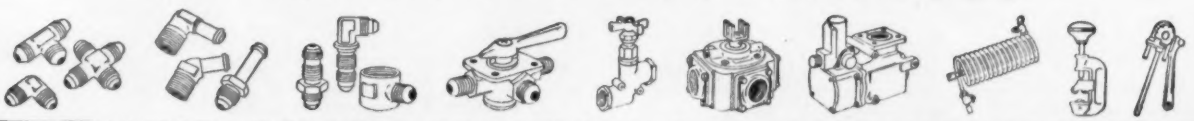
4 Parts are self-aligning and completely interchangeable—for easy installation or disassembly.

There are the reasons why the design of the Parker Triple Coupling is the universally accepted standard for Army-Navy aircraft—the most exacting of all services—and why they insure perfect performance in all industrial applications.

Send for Catalog 201-C—for complete data on steel, brass, stainless or aluminum couplings—⅛" to 1½"—standard or heavy weight. Ask your Jobber, or address The Parker Appliance Co., 17325 Euclid Avenue, Cleveland 12, Ohio.

THE PARKER APPLIANCE CO.

CLEVELAND • LOS ANGELES



FLUID POWER PRODUCTS FOR ALL INDUSTRY

. . . Things We Want IN

Can be Speeded with

Federal WELDERS

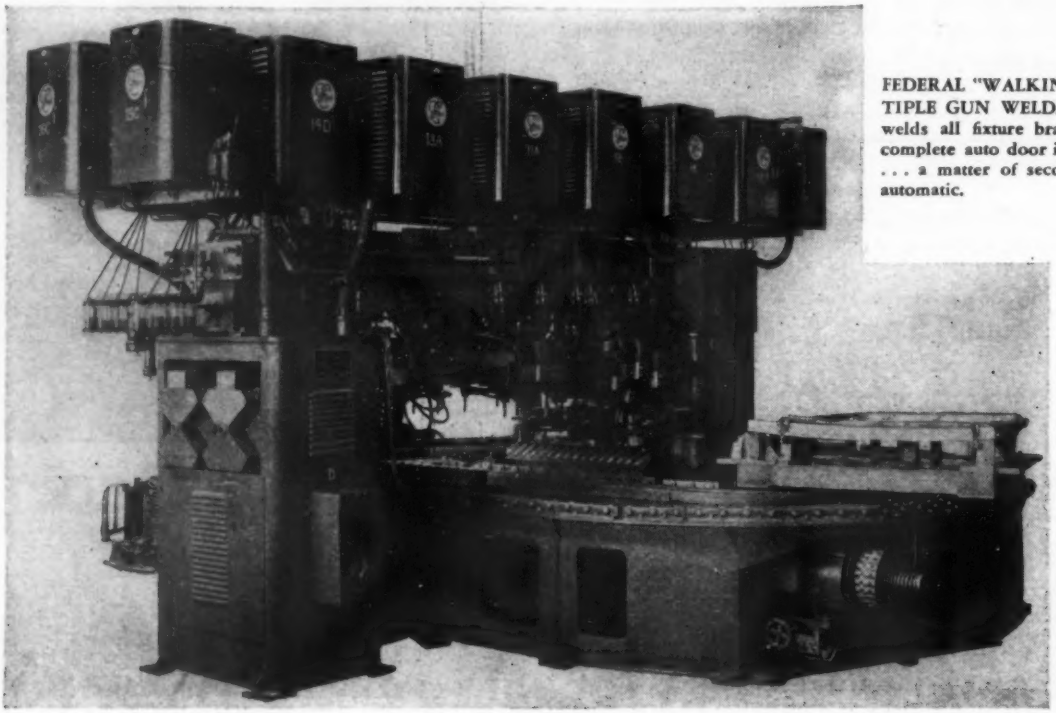
Resistance welders, are built by The Federal Machine and Welder Company, to cut production *time* and *costs* on almost any kind of product you can think of . . . and there never was a time when savings in time and cost were as important as today. For instance . . .

AUTO DOORS are something we are all dreaming of having in a hurry (with chassis and engine attached, of course). The automotive industry employs more resistance welding to cut costs and speed production than perhaps any other single industry; all the way from small spot welders (by thousands) to special Federal machines like the door assembly welder pictured below.

REFRIGERATOR PARTS are mass production items on which Federal Resistance Welders for years have done a big job saving both time and cost. This includes production of grilles, boxes, liners and such tricky items as the refrigerator cooling fin assembly, completed in ten seconds by the Federal Radial Projection Welder pictured on the next page.

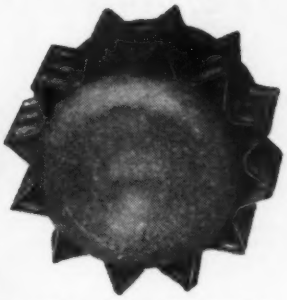
STOVES . . . back in production on a large scale to meet vast pent-up demands, are more swiftly made in modern plants by the use of numerous welded sub assemblies. A typical example is the gas-stove oven liner, welded in a fast, low cost operation on the Federal Multiple Spot Welder shown at right.

AND WHAT HAVE YOU . . . from pin-point-welded radio parts to complete steel sides for freight cars; from pots and pans to heavy assemblies involving flash welds of eighteen square inches cross-section at one whack . . . anything in which metal parts must be permanently, cheaply and rapidly joined. Federal designs and builds machines for any and all resistance welding applications . . . wants to show how they can speed *your* kind of production.



FEDERAL "WALKING" MULTIPLE GUN WELDER . . . welds all fixture brackets to a complete auto door in one pass . . . a matter of seconds. Fully automatic.

A HURRY!



FEDERAL RADIAL PROJECTION WELDER illustrates how odd shaped stampings of all kinds can be assembled with great economy and speed, by completing this eight-inch-diameter cooling fin assembly, 48 projection welds at once, in ten seconds.

FEDERAL MULTIPLE SPOT WELDER speeds stove production by welding this oven liner (on four sides at once) into a sturdy, economical sub-assembly.

NAME OF AUTHORITY IN RESISTANCE WELDING

The Federal MACHINE AND WELDER CO.

MEMBER RESISTANCE WELDER MANUFACTURERS ASSOCIATION RWMA

230 DANA ST., WARREN, O.

VERSATILE MODERN PRODUCTION TOOLS

ALUMINUM WELDING SIMPLIFIED

Important developments in equipment for automatically resistance welding aluminum, accelerated by critical war demands, are now being applied to the speeding of production in every branch of industry, from the making of household utensils and appliances to auto bodies parts, and accessories.

Difficulties encountered in welding aluminum alloys were due to the narrow "margin of safety" in their thermal response. The extreme accuracy of timing heat and pressure required were difficult to attain until perfection of the "stored energy" principle combined with full electronic controls.

The Federal Machine and Welder Company, perfected the first successful welders built specifically for aluminum. In collaboration with manufacturers of electronic controls, this company developed the Federal Unipulse System, in which a capacitor bank is charged (during comparatively long periods between welds) to a precise voltage level, then discharged directly into the welder as a single, uni-directional current pulse for production of the welds.

Among the important advantages of current Federal Aluminum Welders are . . . increased welding speed, higher quality welds, increased volume of production per cleaning of electrodes and lower KVA demands on the power line. Remarkable uniformity and high mechanical strength make it possible to design parts where stress may be involved with a full measure of exactness not possible with old methods.

"TEAMING" METALS BY WELDING

More and more combinations of metals of different characteristics are being teamed into single "product-units" for reasons of economy or greater workability, because of the ease with which such metals can be permanently united by resistance welding. Stainless steel is saved in the making of knives and tools by flash welding to mild steel shanks . . . heavy axe heads are made with most of their weight in low-cost steel, to which high grade hardenable cutting edges are welded . . . innumerable combinations are possible in radio and instrument manufacture, where perhaps a high conductivity must be combined with good spring qualities, not found in any one metal . . . stainless steel can be used for heads of large diesel engine valves and still have stems of steel best suited to stem wear. The Federal Machine and Welder Company designs and builds welders for all of these types of production . . . offers its engineering facilities to anyone with similar problems.

10 TO 20 SPOTS PER SECOND

For fabricators of metal who have production involving ten to several hundred fastenings on one plane a special type of automatic spot welder is available in which automatically operated electrodes are set up in multiples, much like a gang drill. Power demand is comparatively low, as electrodes weld one at a time in rapid sequence. For high production, machines may be had with electrodes in any desired pattern.

Called Ultra Speed Spot Welders, these machines are made by The Federal Machine and Welder Company. Descriptive literature available on request. "Bulletin 515".

MORE AIR IN 12 HOURS!

Worthington "Huskies" Quickly, Easily Installed by United States Hoffman Machinery Corporation

September 12, 1944
Mr. W. A. Meiter, Buffalo District Manager
Worthington Pump and Machinery Corporation
37 Church Street
Buffalo 2, New York
Dear Sir:
You will be interested to know that the third unit of our six 150 HP YC-2 compressors was placed on foundation, piped, and turning over, twelve hours after it was delivered in our plant.
This demonstrates convincingly that this type of compressor saves considerable installation time when compared with a horizontal duplex type unit.
Congratulations for having a real "packaged" large air compressor.
Yours very truly,
UNITED STATES HOFFMAN MACHINERY CORPORATION
Henry C. A. Meyer
Assistant to the President
HCAMims

GET ALL THE FACTS ON MODERN YC AIR COMPRESSOR DESIGN

Write to Publications Dept., Harrison, N.J., for Bulletin L-667-B1 — complete facts on higher speeds, ease of installation, accessibility of the Worthington YC "Huskie" Air Compressors that helped United States Hoffman Machinery Corporation rush the manufacture of shells. Adaptable. . . direct-connected, or easily arranged for belt drive on practically any type of rotative power. Another reason why *there's more worth in Worthington. Worthington Pump and Machinery Corporation, Compressor Div., Buffalo, N.Y.*

WORTHINGTON

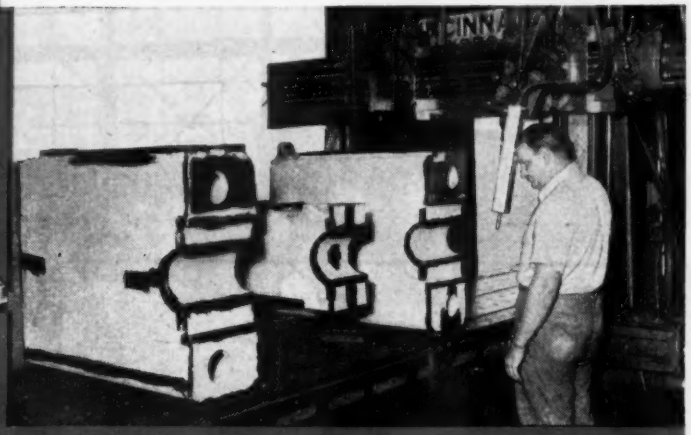
K4-18

NO OTHER COMPRESSOR WILL OUTPERFORM A WORTHINGTON

MODERN PRECISION WELDMENTS FOR HEAVY STUFF"!

Modern large-scale precision weldments, made possible by advanced techniques developed during the war, are already proving highly advantageous in the heavy machinery industries. Special weldments, designed, fabricated and finished at Warren City, are replacing steel castings in many important applications. In the Bliss Enclosed Press shown here, the crowns, beds and slides are now Warren City weldments, saving weight and increasing strength. High precision is assured by accurate normalizing, stress relieving, machining and testing, with the finest and most modern scientific methods and equipment.

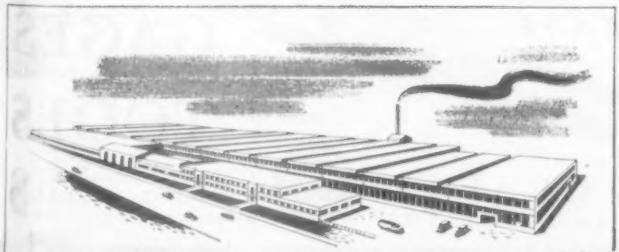
Finishing a precision-tested Bliss press crown, fabricated from welded steel plates at Warren City



WELDMENTS SAVE WEIGHT, ADD STRENGTH, IN FAMOUS BLISS INDUSTRIAL PRESSES

Eliminate Pattern Costs and Casting Defects!

IF YOUR PROBLEM involves the use of heavy steel castings or weldments, be sure you don't overlook the unusual production facilities and know-how available to you at Warren City Manufacturing Company. Located in the heart of the Cleveland-Pittsburgh industrial area, our huge seven-million-dollar plant contains every modern device for handling, cutting, fabricating, welding, normalizing, machining, assembling and testing heavy steel machinery, parts and equipment. Whether, as in the case of the E. W. Bliss Company, your situation may call for redesigning your present steel castings to enjoy the many advantages of modern precision weldments, or whether your need is simply for extra production capacity without increasing the size of your plant, our engineering staff will be glad to offer you their recommendations without obligation. Write today for our illustrated brochure, including a complete listing of our modern and extensive facilities.



WARREN CITY MANUFACTURING COMPANY ☆★★

DEPARTMENT E

WARREN, OHIO

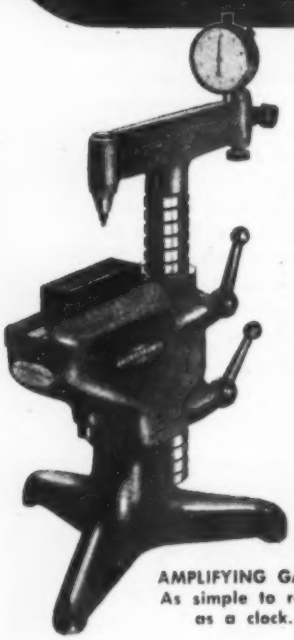
Wholly Owned Subsidiary of

GRAHAM-PAIGE MOTORS CORPORATION

Do You Want

QUICK, ACCURATE CHECKS Of INTERNAL and EXTERNAL Diameters?

HOLE CHECKER
for Inspection and
Production gaging.



AMPLIFYING GAGE
As simple to read
as a clock.

These Modern AMERICAN GAGES are the Answer!

The HOLE CHECKER gages inside diameters up to 12" for size, taper, bell-mouth and out-of-round condition.

The AMPLIFYING GAGE checks pistons, bushings, valve stems, piston pins, etc., up to 5" diameter.

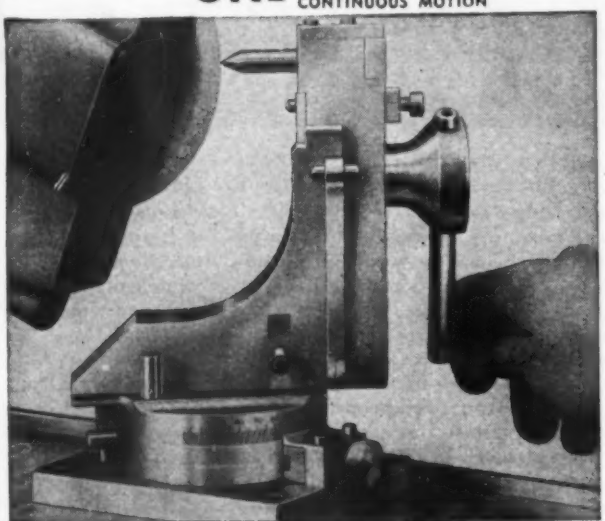
These instruments are easy to set up; rapid and precise in operation. Accurate to .0001".

Send your part prints or sketches for quotation on Hole Checker unit and sizing plugs made to meet your production requirements.

Request Bulletin 43-MT for details on Amplifying Gage, Hole Checker, Thread Checker, Bench Center, Radius Dresser and Lapping Plate.

THE AMERICAN GAUGE CO.
125 Bayard St. DAYTON 1, OHIO

USE
Fluid-motion
for modern form-dressing
ONE SETTING HANDLE CONTINUOUS MOTION



The J & S Model "E" Radii & Angle Dresser in the new "Fluid-motion" series is one of the finest precision dressing instruments procurable—regardless of cost.

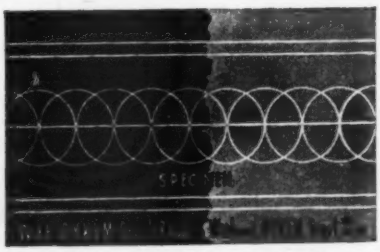
FEATURES

Fluid-motion dressing.
.0001" accuracy.
Automatic centering.
Chatterless and dustproof.
14" wheel capacity.
Versatile and adaptable.

J. & S. TOOL CO.
477 MAIN STREET
EAST ORANGE 1, N. J.

DYKEM STEEL BLUE

STOPS LOSSES
making dies & templates



simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information
THE DYKEM COMPANY, 2301 B N 11th St., St. Louis, Mo.
In Canada: 444 Pacific Ave., Toronto, Ont.

CRAFTS

CARBIDE TIPPED
Consistent Quality
GAGES AND TOOLS

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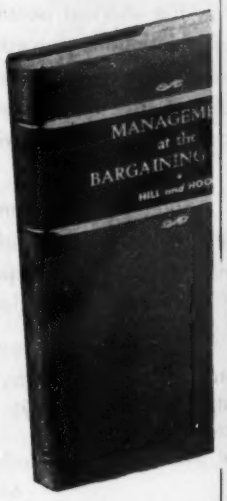

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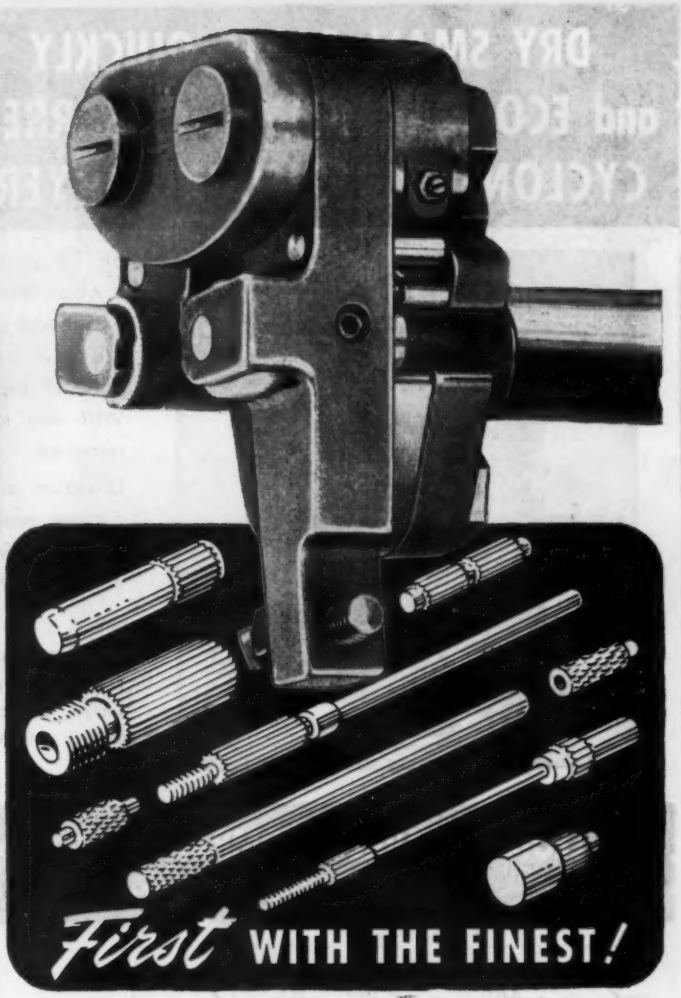

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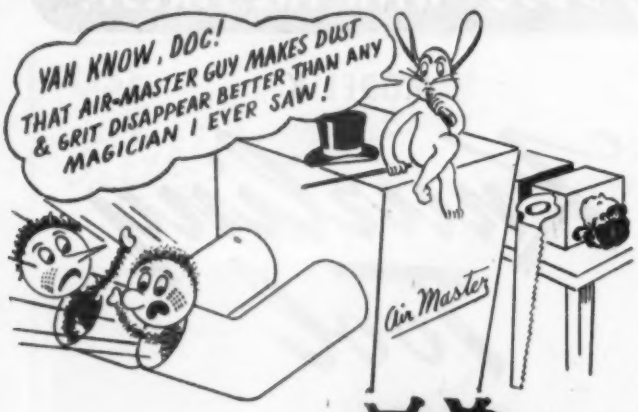

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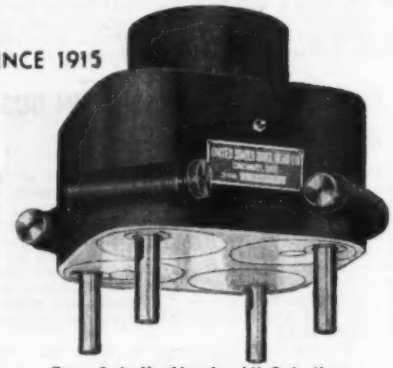

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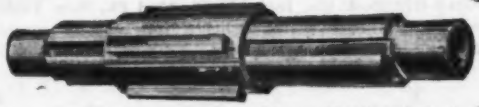

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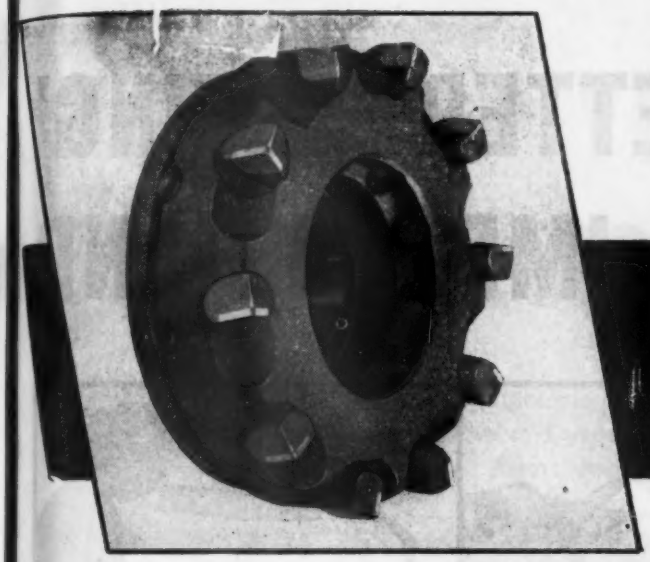

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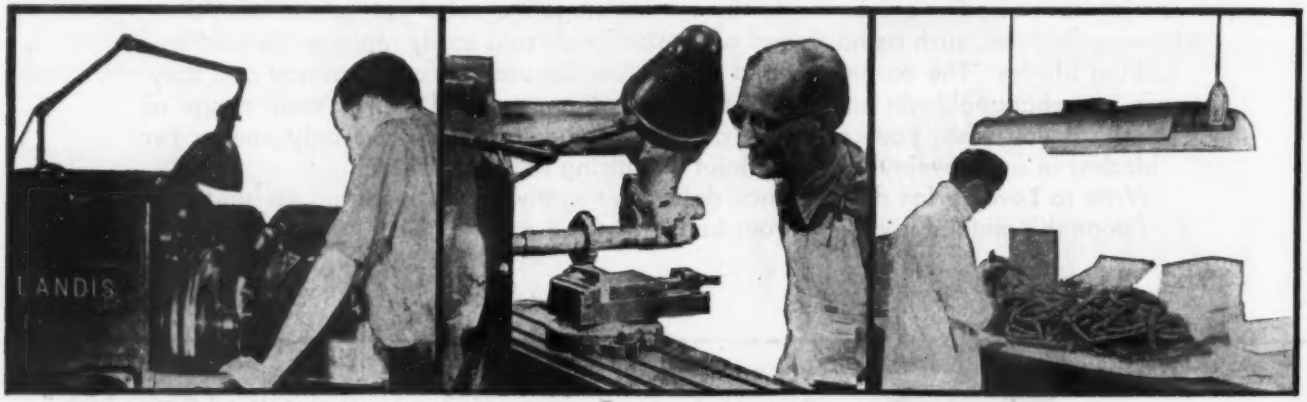

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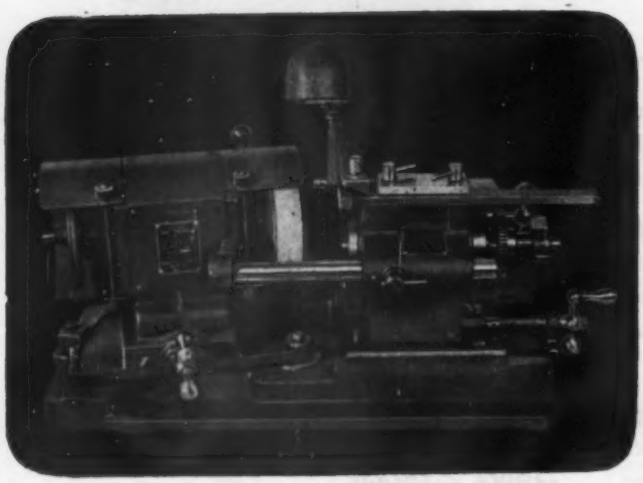

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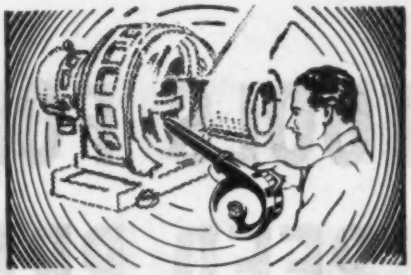

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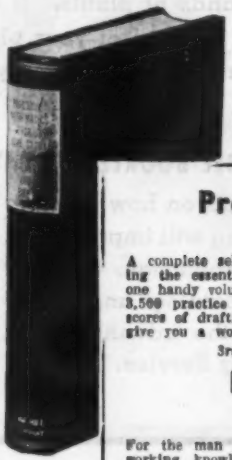

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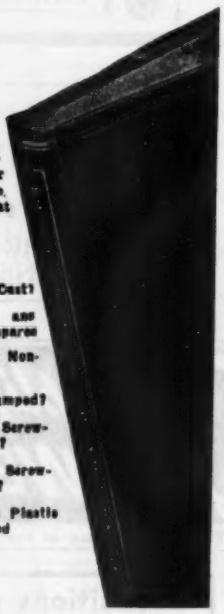

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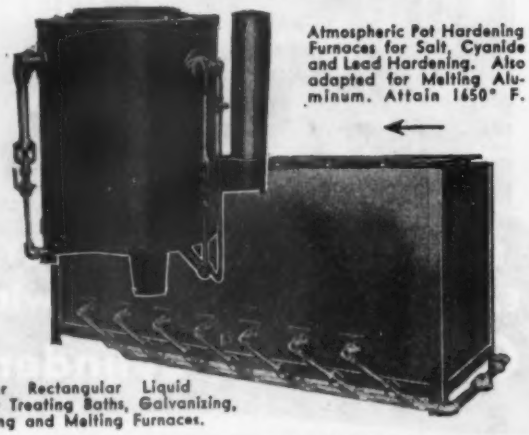

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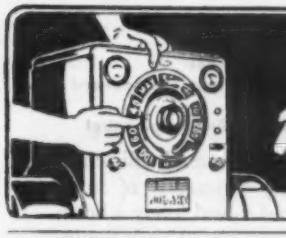

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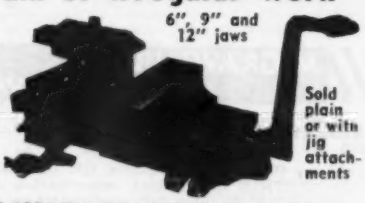

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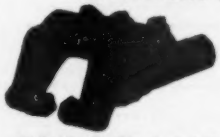

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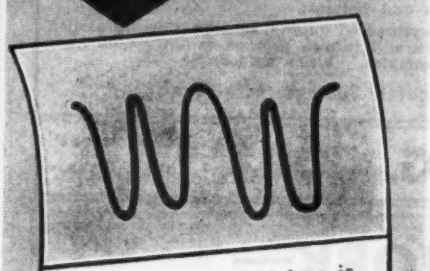

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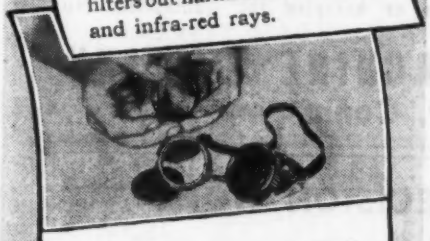

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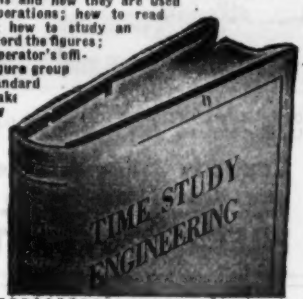

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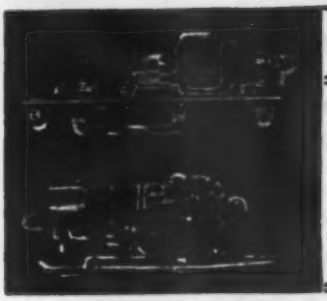

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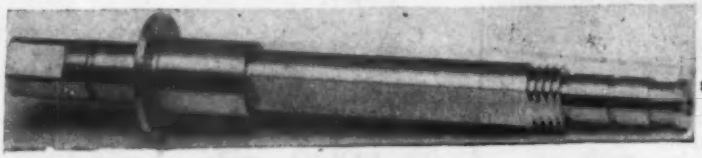

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(Continued on page 334)

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SEARCHLIGHT SECTION

(Continued from page 333)

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Additional Selling Opportunity Ads on page 335

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. . . will act as manufacturers agent in Cleveland and northern Ohio. Seven years industrial selling experience, B. S. degree in Mechanical Engineering . . . employed for the past five years as District Manager for large metal working company. Well acquainted in Great Lakes region. Interested parties contact

RA-484, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

Argentine Company with important factory of metallurgical products and vast sales organization in the principal cities of the Argentine Republic, wishes to represent well-known industrial machines, tools, ironware of all kinds, etc.

For further details please write the Leo J. Murray Company, Franklin, Massachusetts, or directly by "air-mail" to the "Sociedad Anonima Industrial y Comercial, La Metalurgica Rioplatense, Moreno 634, Buenos Aires, Argentina.

New "SEARCHLIGHT" Advertisements

received by 10 A. M. November 7th will appear in the November 22nd issue subject to limitation of space available. Address copy to the

Departmental Staff
AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED

SALES ENGINEER

Knowledge of Gears and Gear Application essential. Reply giving age, experience and salary expected.

GRANT GEAR WORKS, INC.
154 WEST SECOND ST., S. BOSTON

WANTED

AUTOMATIC FOUR SLIDE WIRE FORMING MACHINES SIZE 4 AND LARGER.

EASTERN TOOL & MFG. CO.
129 BLOOMFIELD AVE. BLOOMFIELD, N. J.

WANTED

WIRE FORMING EQUIPMENT

NILSON 4-SLIDE MACHINES. ANY TYPE—ANY SIZE.

PLEASE WRITE TO

W-467, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

FOR SALE
600 TON HYDRAULIC PRESS

Watson Stillman rebuilt 48" single daylight opening, downward double acting ram 16" dia. by 21" stroke, platen 24"x24" with clear space left to right 30¾" between 5½" dia. strain rods. We will purchase your Surplus Equipment.

UNIVERSAL HYDRAULIC MACHINERY CO.
285 Hudson Street New York, N. Y.

WANTED

For Urgent Production

SELL DIRECT TO USER

2—Straightside, Double Crank Presses 50" to 72" Bet. Housings. 125 to 200 Tons.

4—Open Back Presses 6" to 12" stroke. 60 to 100 Tons. 12" min. die space.

Also other similar stamping presses, shears, brakes and sheet metal equipment

WRITE, PHONE OR WIRE COLLECT

OK MACHINE CO.
Phone Harrison 2214
2131 Fairfield Ave., Ft. Wayne 6, Ind.

FORGING EQUIPMENT

4" National Upsetting Forging Machine
7" Ajax Upsetting Forging Machine
1500# Chambersburg Steam Hammer
3000# Chambersburg Steam Hammer

IRON & STEEL PRODUCTS, INC.
13498 S. Brainard Ave. Chicago 33, Illinois
"ANYTHING containing IRON or STEEL"

LARGE BENDING ROLLS

Niles Pinch Type Bending Rolls 14 ft. with two 20" diameter Geared Rolls and one 18"; Motor Driven. Direct geared. 35 H.P. and 26 H.P. 3/60/220 Volt.

L—6 ft. American Triple Purpose Plain Radial Drill, 15 H.P. 230 Volt DC Motor on arm. Bargain.

H. J. KOONTZ, Massillon, Ohio, Phone 8180

UNIVERSAL TOOLS!
NATIONALLY ADVERTISED BRANDS AND PRICES

If It's A Tool—We Have It, Can Get It, or It Isn't made. PRICE LIST & ORDER BLANK FREE!

UNIVERSAL TOOL COMPANY
O. B. Domattois, President
1527 Grand A.M. Kansas City, Missouri
Immediate Shipments: Overnight by Air: To Anywhere—U.S.A.

SEND FOR OUR SPECIAL PRICES OF PRECISION TAPPER GROUND TAPS

High speed tapper taps, bent and straight shank. Sizes ranging 3/56 to 10/32 in 90° bent shank. Sizes ranging ¼-28 to ½-20 NF in 90° & 180° bent shank. Sizes ranging ¼-28 to ¾-16 in Acme and straight shank 15" overall. ALL GOOD STANDARD BRANDS FOR IMMEDIATE DELIVERY.

DE WITT TOOL COMPANY
173 GRAND STREET, NEW YORK 13, N. Y.
SEND US YOUR INQUIRIES

AUTOMATICS

4—1¼"—4 Sp. Model M. Cleveland, M.D.
3—1"—5 Sp. Model C Gridley Automatic

GRINDERS

1—#13 B. & S. Universal, M.D.
1—Bath Universal, counter shaft drive
4—1¼" Oliver Drill Grinder, M.D.

LATHES

16"x8' Ledge & Shipley, Q.C.G. Taper Att.
11"x4' Sheldon, Q.C.G.
2—16x8 Hendey Geared head lathes

DRILLS

4—6 spindle Allen 8" High Speed #2 Morse Taper
1—3 spindle Allen 8" High Speed #2 Morse Taper

MILLS

1B—Kearney & Trecker, double overarm, M.D.
2B—Kearney & Trecker double overarm M.D.
#3 B. & S. Vertical Mill

PRODUCTION LATHES

2—1"x18" Pratt & Whitney Automatic.
1—8" Sunstrand Stub Lathe M.D.

MILLS MACHINERY SALES
3126 GRAND RIVER DETROIT, MICH.

ABSOLUTE PUBLIC AUCTION SALE

COMPLETE SHIPBUILDING FACILITIES, MACHINE TOOLS, CRANES & INDUSTRIAL YARD EQUIPMENT

By Order of **THE AMERICAN SHIPBUILDING CO. (Cleveland Plant)**

ON THE PREMISES: **FT. OF WEST 54th ST. & BULKLEY BLVD., CLEVELAND, OHIO**

SALE DATES: WEDNESDAY AND THURSDAY, NOVEMBER 14th AND 15th, 1945

TIME OF SALE: **REAL ESTATE will be sold at 11:00 A.M. WEDNESDAY NOVEMBER 14th**

MACHINERY AUCTION SALE will start at 1:30 P.M. WEDNESDAY NOVEMBER 14th, and 10:30 A.M. THURSDAY NOVEMBER 15th

Inspection Date: **NOVEMBER 8th to Sale Date.**

— PARTIALLY COMPRISING —

FABRICATING & PLATE SHOP: *5 Sets Plate Bending Rolls*—up to 24', 1" capacity, including: Hilles & Jones; Southwark. *16 Single End Punches*, all geared, motor drive, up to 60" throats, capacities up to 1½" x 1½", including: Southwark; Cleveland; Beatty. *8 Single End Shears*, all geared motor drive, up to 48" throats, capacities up to 1¼" x 1¼", including: *Southwark; Beatty, Long & Alstatter, Cleveland Angle Shear, Straightening Rolls and Presses, Beam Benders, Hydraulic Joggler, Wall Radial Drills, 200 Bending Plates, 36 Jib Cranes, Lidgerwood Hoists*, Etc.

MACHINE SHOP: *Vertical Boring Mill*, up to 16'. *Lathes*, up to 72" swing. *Shapers, Millers, Planers* (Including: 84"x84"x20' DETRICK & HARVEY OPENSIDE) *Radial Drills & Upright Drills*, Etc.

CRANES & RUNWAYS: *11-Overhead Electric Traveling Cranes* (Including 2 T. 7½ . 10 T. 25 T. and 30 T.) *Spans* from 37' to 94'; *All* 3 and 4 Motor, some with auxiliary hooks, 230 volts D.C., *Shaw-Box; P & H, Shepard, Toledo, Northern. 20 T. 25 T. and 30 T. Ohio* and *McMyler Locomotive Cranes; 80 T. Steel Shear Leg Derrick, Also . . . Overhead Elec. and Gantry Crane Runways.*

PIPE SHOP. Including: *Cox Mechanical Pipe Bender*, capacity up to 4½", Also . . . Pipe Threaders and Bolt Cutters.

SHEET METAL SHOP—Including: 12' Cinn. All-Steel Brake; Squaring Shears, Beaders, Etc. WELDING EQUIPMENT: Including: 38 Portable Welders, up to 400 Amp. gas and motor driven; 15 Sets of Burning and Welding Torches with trucks. FORGE & BLACKSMITH SHOP: Including: Chambersburg Hammers up to 2500#; Hardening Furnaces; Plate and Angle Furnaces; Blowers, Etc. WOODWORKING SHOP: Including Surfacers; Shapers; Band Saws; Tenoners; Molding Machines; Jointers, Etc. MISCELLANEOUS: 100 Chain Hoists up to 3½ T; 300 All-Steel Clothes Lockers; 25 Portable Elec. Drills; Hundreds of Pneumatic Drills; Riveting and Chipping Hammers; Corner Drills; Grinders; Rubber Hose; Hydraulic Jacks; Platform Scales; Milling Cutters; Reamers; Tool Holders; Pipe Wrenches; Boring Bars; Surface and Angle Plates . . . and thousands of items too numerous to mention.

MACHINERY SALES ARE ABSOLUTE: REAL ESTATE SOLD SUBJECT TO APPROVAL OF OWNERS WITHIN 5 DAYS

A COMPLETE DETAILED AUCTION CIRCULAR WILL BE SENT FREE ON REQUEST:
FOR MACHINERY CIRCULAR — write — wire — phone — FOR REAL ESTATE CIRCULAR

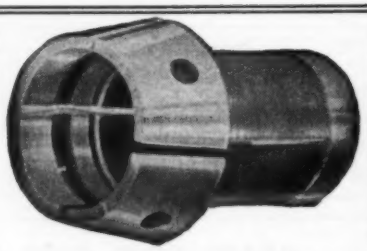
INDUSTRIAL PLANTS CORPORATION

Professional Auctioneers, Appraisers, Liquidators

90 WEST BROADWAY, N. Y. 7 (Chicago; Toledo, O.; Pitts., Pa.)

Joseph P. Day Inc. Auctioneer
CHRYSLER BUILDING, N. Y. C.

USED COLLETS
FEED FINGERS — PADS



ACME. No. 515, No. 52, No. 53, No. 54, No. 55, No. 56.
ACME-GRIDLEY 1⅜" and 2⅜".
Cleveland ⅞" to 2½".
Cone 1¼", 1½", 2½", 4".
Foster No. 1, No. 2, No. 3, No. 4, No. 5, No. 7.
Gridley, Models F, ¾", ⅞", 1¼", 1⅜", 2¼", 2⅜", 3¼", 4¼"
⅞ Model "G" Gridley Form. Lead and Cut Off Cams & Collets.
No. 4, No. 6 Warner & Swasey.
Bardons & Oliver, Brown & Sharpe, Davenport, Garvin.
LARGE STOCK OF 2⅜ R. A. 6 Gridley parts.
Change Gears, Lead Cams, Form Cams, No. 53 to No. 56 Acme.
Spindle gears, finger holders, collet tubes, push tubes, spindles, nose pieces for 2⅜" F Gridley and 2⅜ R. A. 6.
Large stock 1⅜" F. Gridley Collets.

SPECIAL Die Heads and Chasers

GRAFF MACHINE TOOL COMPANY
7140 S. Halsted Street — Vincennes 9664 — Chicago 21, Ill.

FOR SALE
NO. 26 NORTON HYPROLAP

In perfect condition—

Complete and ready to run—
Used only 5 months.

Original Cost.....$7,073.00
Sale Price $3,500.00

VULCAN BEARING MACHINE CO.
2504 Commerce St. Dallas 1, Texas

SHEET METAL MACHINERY

NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders

MONA **B. D. BROOKS, INC.**
301 Atlantic Ave., Boston, Mass.

FOR SALE
INDUSTRIAL OVEN

NEW, gas-fired, continuous-convection type industrial oven. Completely equipped with safety controls, automatic heat recording and control. Maximum 1000°F. Maximum load capacity on conveyor 60 lbs. per sq. ft. Variable speed driven. Approximate inside dimensions 30 ft. long x 6 ft. wide x 2 ft. high.

Detailed specifications on request.

BRIGGS CLARIFIER CO.
Special Products Division
WASHINGTON 7, D. C.

FOR SALE

1—Twin Openside Planer
1—6 ft. Prentiss Radial Drill
1—24" Dill Slotter
1—Patch Granite Polishing Machine
1—Pond Lathe 24" swing
3—Double Platen Patch Planers

Prices on application

VERMONT MARBLE COMPANY
PROCTOR VERMONT

AUTOMATIC SCREW MACHINES

LATE TYPE (Less than 5 Years old)
Acme Gridley R.A. 6 spindle, 1" x 1¼"
New Britain Gridley, 6 spindle #60, 1" cap.

TRI MACHINE & TOOL CO.
248 LAFAYETTE ST., NEW YORK CITY

Atlas 7B Shaper; Delta 2 spindle 17"; Drill Press New Juno 1945; Fitchburg 42"x19" Lathe; Hendey 20"x10'; Lodge & Shipley 18"x12'; Lodge & Shipley 16"x5'. Reliable Jewelers 10"x57", all lathes except Fitchburg with Drive-alls. Also Atkins power hack saw, GE2HP 1750AC Grinder, Buffalo 10" bench drill.

UTILITY ELEVATOR SERVICE
34 Jumel Place — New York City

EVERY ITEM GUARANTEED AS REPRESENTED

FALK FOR DEPENDABILITY IN REBUILT MACHINERY

AUTOMATICS

6—#61 New Britain-Gridley 6 Spindle 1⅝" cap. Automatic Screw Machines. A.C. Motor Drive, Threading Spindle.
1—1¼" Cone 4-spindle Automatic, Motor Driven, Threading Spindle.
1—#515 National Acme 1 ⅝" 4-spindle Automatics, complete.
2—#55 National Acme 1⅝" 4-spindle Automatics, complete.
1—#2G Brown & Sharpe Automatic.
1—#1 Brown & Sharpe Automatic, old style.
#0 Brown & Sharpe Automatic, Belt Drive.

BORING MILLS

100" Niles-Bement-Pond Bor. & Turn. Mill.
Horiz. #36 Landis-Rochester, 3½ Bar Floor Type—Floor Plate 72"x120".
42" Bullard Vertical Boring Mill with side head; New Era Type.
#31 Lucas Horizontal Boring Mill, 3" bar.

DRILLING MACHINES

Bickford 4-spindle Rail Drill, #4 Morse Taper. Table 20"x67".
Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle.
Woodward & Rogers, 6 spindle.
Fosdick 13" high speed, 4 spindle (2). 2 spindle (1).

RADIAL DRILLS

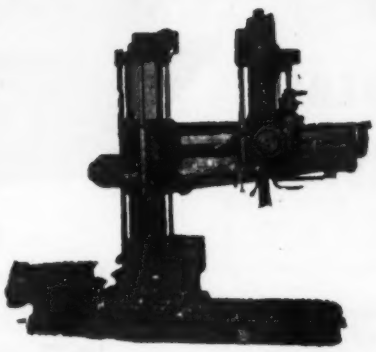
3' 9" col. American, S.P.D.
3' Dreses, 10" rd. col. QCG., M.D.
3' Fosdick 10" Col. Motor Drive.
5' Arm 13" Rd. Col. Cinn. Bick. air clamp.
6' Arm 14" Col. Cincinnati Bickford

GRINDERS

12" No. 22 Heald Rotary Surface Grinder.
16" Persons-Arter Rotary Surface Grinder.
#4 Brown & Sharpe Universal Grinder.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump. 15" swing, 5" hole, 4" dee.
Oliver Model 51 Drill Grinder; 1½" cap.
6"x32" Norton Cyl., overhead c/s drive.
#2 Brown & Sharpe Surface Grinder.
#70 Heald Internal Grinder.
#60 Heald Cylinder Grinder
3—#2 Cincinnati Centerless Grinders.
1—4x12 Landis Hydraulic Cylindrical Grinder, New.

Blanchard Grinder #16, 30" dia. Magnetic Chuck, 25 HP 3-60-440 V. Motor.

Pratt & Whitney Vertical Surface Grinder, 14"x36" with 10"x36" Magnetic Chuck. Ball Bearing Spindle. Perfect Condition.



Cincinnati-Bickford 5' Arm, 13" round column with air clamp. Oil grooved, tee slotted base, side base, with plain box table with #5 Morse Taper spindle. Motor drive.

LATHES

14x6 Pratt & Whitney semi—Q.C.G.
16x8 Hendey Arranged M.D., Taper
16" Warner & Swasey Fox Brass (2).
16" Dreses Fox Brass.
Putnam 26x12 Heavy Q.C.G., arr. for M.D.
Potter & Johnston #6A Automatic Chuckers; 3½". dia hole in spindle (2).
14x6 Hendey Toolroom Lathe, G.H., M.D.
14x8 LeBlond Toolroom Lathe, cone drive
14"x6' Hendey 12-speed geared head.
14"x102" centers Hendey motor driven Lathe.
20"x10' Hendey.

MILLING MACHINES

#3, #4, #5 Cinn. High Power, Plain, S.P.D.
No. 0 Bickett Vertical Bench Miller.
#1-#1½-#2 Brown & Sharpe Plain Miller.
P & W 2½" Duplex Spline Miller.
Hall Planetary Thread Miller 24".
#8 Lees Bradner Thread Miller.
#1-#2—Kempsmith Plain Milling Machines
#2½, #3 LeBlond Universal.

PLANERS

30"x30"x12' American M.D., 2 Heads.
30"x30"x10' Cinn. Heavy Pattern, 2 Hds.
20"x20"x24" N.-B.-P., Planer Shaper, M.D.
24"x24"x6' Cincinnati, 2 heads, M.D.

POWER PRESS HEADQUARTERS

#4½ Bliss D.C., B.G. Forging 3" stroke.
200 ton A.C.F. Hydraulic Press. Bed 24"x 36", 4-post.
7—25 ton Model SL2 K.R. Wilson hydraulic Presses.
Beck Duplex Embossing Press.
75 ton H.P.M. 2 post, Hydraulic Press.
#1 Bliss Straight Side, double action, Cam Press. Will draw and lift out 2¾".

SHAPERS AND GEAR CUTTERS

12" Schuchart & Schutte Gear Hobber.
#1 Adams Gear Hobbers, Belt driven (3).
#13 Brown & Sharpe Spur & Bevel Gear Cutter.
16" Smith & Mills.

SHEARS & METAL CUTTING MACHINERY

Lennox Splitting Shear, ¾" cap.; 8' throat.
Lennox Bevel Shear, ¾" cap.
Bliss #232 Slitting Shear, 14 ga.
Gould & Eberhardt Slitting Shear, 10 ga.
Niagara 16 ga. x 42" Gap Foot Shear.
Niagara #95 Power Seamer.
Niagara 4"x42" Geared Slip-Roll Former.
Niagara 3"x36" Geared Slip Roll Former.
Niagara 48" Roller Leveller, 6 Rolls.
Niagara #4-R Squaring Shear, 48"x¼" capacity, M.D.
Cleveland 8'x⅜ Plate Shear.

MISCELLANEOUS

Waterbury-Farrel Cold Header, double stroke, open dia, ½" cap. & 6".

Manville Cold Header, single stroke, solid die, 3/16" cap.

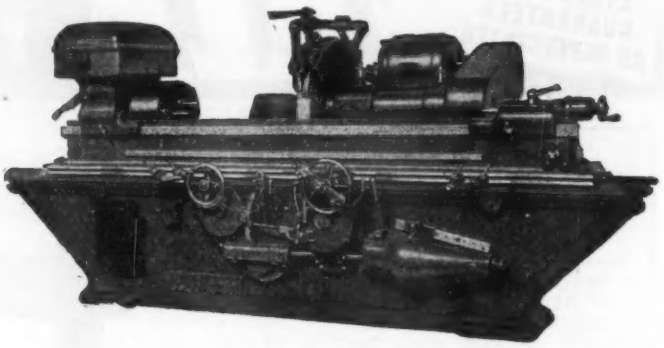
J. C. Miller Co. Lacquar Heater with acquistat.
Heat Treating Furnaces for the tool room.
Sleeper & Hartley #1 Wire coiling machine for making BX cable.
Hydraulic Pumps—Hele Shaw, Racine, Oil Gear, Motor Driven.
Blake and Knowles 12x2x12 Simplex Type, Hydraulic Steam Pump, 2000 lbs. pressure with 80 to 125 lbs. steam, delivers 9 gallons per minute.
#228C Greenlee Vertical Hollow Chisel Mortizer, Power feed, M.D.
No. 7B High Speed Riveting Hammer, cap. ¾" to 1½. New this year.
High Speed Riveter, #58.

BUY FROM STOCK
Telephone
MAIN 6347-6348

FALK
MACHINERY COMPANY
Machinery Merchants

18 WARD ST.
ROCHESTER 5
N. Y.

HILL-CLARKE
Modernized
CYLINDRICAL GRINDERS *for* SUPER-GRINDING *and* MICRO-FINISH



SIZES AVAILABLE

10x24	14x36	16x50
10x36	14x50	16x72
10x50	14x72	18x96
10x72	14x96	18x120
10x120	16x36	

Hill-Clarke Modernized and Motorized Cylindrical Grinders offer refinements in design which minimize vibration and assure extreme accuracy on all grinding operations. One of these refinements, the Hill-Clarke patented Multiple V-belt Drive to work spindle, contributes to the smoothness in operation which makes possible a finish within a few micro-inches even when using standard grain free-cutting wheels.

Send for a copy of our catalog "Super Grinding."

HILL-CLARKE MACHINERY CO. CHICAGO U.S.A.

Have you any NORTON grinders you wish modernized and motorized?

HILL-CLARKE MACHINERY CO.

651 WASHINGTON BOULEVARD **CHICAGO 6, ILL.**

USED LATE TYPE BROWN & SHARPE TOOLS

1—#2 Light type Universal Miller with #0 Vertical Attachment—New 1942

2—#2 Vertical Millers—light type—New 1942

1—#5 Surface Grinder—8" x 24" Hydraulic type with magnetic chuck New 1942

2—#000 Plain Automatic Millers—new 1942

2—#12 B & S Plain Automatic Millers—Electrically controlled—New 1942 or 1943

1—#2 B & S Surface Grinder—New 1943 (220-3-60)

MANY OTHER LATE TYPE MACHINES IN STOCK

REYNOLDS MACHINERY CO.

210 Eddy Street
Providence 3, R. I.

READY TO SHIP

LATHES

2—Pratt & Whitney 14" x 6', SQCG., T.A.
1—Prentice Bros. 24"x18' Grd. Hd., arr. M.D.
1—Blaisdell 24" x 10', L.C.G., T.A.
1—Prentice 14" x 8', QCG, M.D., Driveall.
2—Hendey 18" x 10', Grd. Hd. arr. M.D., 1 with Taper Attach.

GRINDERS

1—Norton Cam Grinder, M.D., late type.
1—18" Ball Bearing Dble. End Disc Grinder with adj. tables, 5 hp., 3/36/220 (new 1943).
1—Norton 6" x 18" Hyd. Surface Grinder, wet attch. (1942)
1—Cincinnati #2 Tool & Cutter Grinder with equip. (1943)

MILLERS

1—#4B Brown & Sharpe Plain, hvy., all geared, arr. M.D.
1—#2M Potter & Johnston.
1—Cincinnati 24" Duplex, No. 50 taper, arr. M.D., late type, excel. cond.

MISCELLANEOUS

1—Jones & Lamson 2¼"x24", steel head, bar feed, tooling, ser. over 41,000 (1936).
1—24" Gould & Eberhardt Shaper, arr. fast. M.D.
1—36" x 36" x 10' Powell Planer, 1 rail hd., 1 side hd.
1—30" x 30" x 10' Putnam Planer, 2 rail hds.
1—Peerless Shaping Saw, 6 x 6, arr. M.D.
1—Ammco 7" Shaper on Bench, M.D. (new).
1—24" x 24" x 6' Whitcomb Blaisdell Planer, arr. M.D.
1—Cincinnati Snagging Grinder, 7½ HP, almost new.
1—Oilgear Hyd. Straightening Press.
1—Acme 1" Bolt Threader, 3 Spdle.

UNITED MACHINERY & TOOL CORPORATION

34 Hermon St., Worcester 8, Mass.

No. 2M Cincinnati Plain Mill, M. D.

Mattison 12" x 16" x 48" Hydraulic Surface Grinder.

MDIA

D. E. DONY MACHINERY CO.

47 Laurelton Road, Rochester 9, N.Y.

#3KM Kearney & Trecker Vertical Miller, rotary table, 1940
#4H Kearney & Trecker Vertical Miller, 1940
#2MS Cincinnati Dial Type Plain Miller, 1940
#22-L Van Norman Universal Miller, 1940
#5 Jones & Lamson Ram Type Turret Lathe, 1940
42" and 54" Bullard Spiral Drive Vertical Turret Lathes, 1942
54" x 34" Houstaon, Stanwood & Gamble HD Engine Lathe
2 carriages, 2 Taper Attachments.

Many more, large and small. Send us your inquiries.

HAZARD BROWNELL
Machine Tools
350 Waterman St., Providence 6, R.I.
Dexter 8880

LARGE LATHES

30"x26' Lodge & Shipley 12 speed Geared Head, M.D.
32"x35' Wickes Grd. Hd., M.D.
36"x30' Putnam Grd. Hd., M.D.
42"x16' Putnam, M.D.
36"x22' Putnam Geared D.C. M.D.

AARON MACHINERY CO.
45 CROSBY STREET NEW YORK, N.Y.

600 LATEST TYPE MACHINE TOOLS

TIMKEN BEARING — MOTOR DRIVEN

ALL PRACTICALLY NEW — BUILT AFTER 1941

MILLING MACHINES
Plain & Universal

11—BROWN & SHARPE No. 2 Plain
1—BROWN & SHARPE No. 2B Plain
8—BROWN & SHARPE No. 2 Universal
2—BROWN & SHARPE No. 2A Universal
4—VAN NORMAN No. 22L Universal
2—VAN NORMAN No. 36 Universal

MILLING MACHINES
Automatic & Thread

1—BROWN & SHARPE No. 000 Automatic (Plain)
8—BROWN & SHARPE No. 10 Automatic (Plain)
24—BROWN SHARPE No. 12 Automatic (Plain)
24—KEARNEY & TRECKER No. 1218 Simplex Automatic
2—PRATT & WHITNEY Model C 6 x 20" Thread
5—LEES BRADNER No. LT Thread

TURRET LATHES

9—WARNER & SWASEY No. 3 Universal
6—WARNER & SWASEY No. 4 Universal
4—WARNER & SWASEY No. 1A
7—WARNER & SWASEY No. 2A
2—BARDONS & OLIVER No. 2
2—BARDONS & OLIVER No. 3
1—BARDONS & OLIVER No. 5

SCREW MACHINES — Hand

1—BROWN & SHARPE No. 0, wire feed, 3/8" cap.
2—BROWN & SHARPE No. 1, wire feed, 5/8" cap.
2—BROWN & SHARPE No. 2, wire feed, 1" cap.

LATHES — Engine

8—MONARCH 10" x 20" Sensitive Precision Toolroom
4—HENDEY 12" x 30" 12-speed geared head
4—HENDEY 12" x 54" 12-speed geared head
4—HENDEY 14" x 42" 12-speed geared head
4—HENDEY 12" x 54" #1 Precision H.S. Turning
4—HENDEY #3, 54" High Speed Turning

LATHES — Speed

7—BLOUNT 4' x 6' bed
14—HAMMOND type L
14—HAMMOND No. 5

GRINDERS — Plain

8—BROWN & SHARPE No. 5 Cylindrical
1—BROWN & SHARPE No. 23 Cylindrical
2—LANDIS type H, 4 x 18" Hydraulic
3—LANDIS type C, 10 x 48" Hydraulic

GRINDERS — Universal

5—BROWN & SHARPE No. 1—max. dia. work 1"
3—BROWN & SHARPE No. 2—max. dia. work 5"

GRINDERS — Internal

1—HEALD No. 70A 3-motor drive

GRINDERS — Surface

21—BROWN & SHARPE No. 2B
6—NORTON 6 x 18 hydraulic
3—ABRASIVE No. 3B
1—PRATT & WHITNEY 14x60" Vertical
6—BLANCHARD No. 18

GRINDERS — Tool & Cutter

15—LeBLOND No. 2 Univ. Tool & Cutter
2—GORTON Cutter
1—TAYLOR FENN Cutter
7—PRATT & WHITNEY Contour

DRILL PRESSES — High Speed

4—ALLEN Bench Type HMDB
2—ALLEN single spindle type WB
1—ALLEN single spindle #3
1—ALLEN two-spindle #2 type WB
16—ALLEN three-spindle type B
2—ALLEN five-spindle type WB
12—ALLEN six-spindle type B

DRILLING MACHINES — Deep Hole

4—PRATT & WHITNEY 2-spindle
4—PRATT & WHITNEY 1/2B x 30" 2-spindle

SHAPERS

1—HENDEY 12" high speed
1—HENDEY 24" Standard Crank
1—CINCINNATI 24" Heavy Duty

PRESSES

7—GREENERD Arbor—Nos. 3 1/2, 4, 5
3—WATSON STILLMAN Hyd. Straightening
4—BILLINGS & SPENCER No. 2 Hot trimming

MISCELLANEOUS

4—BROWN & SHARPE No. 2G High Speed Auto. Screw Machines
4—BILLINGS & SPENCER Mod. D", 1200" cap.
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2—PRATT & WHITNEY No. 12B 2 spindle Profilers
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LODGE & SHIPLEY 20"x10' geared head
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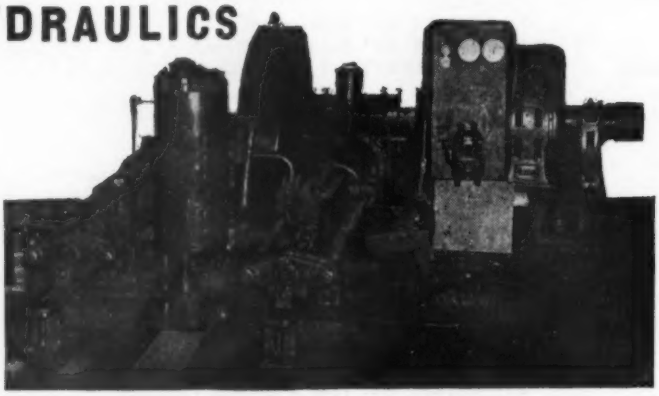

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Gear cutter, Gould & Eberhardt 42"
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HackSaw, 12 x 12 Racine
Milling machine #3 Rockford Universal
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One 16"x6' Hendey Lathe
Pipe Machine, 8" Oster motor drive
Planer 24"x24"x6' Pease, motor drive
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Shaper, 16" Barker
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18" Cincinnati Plain Mfg., s.p.d.
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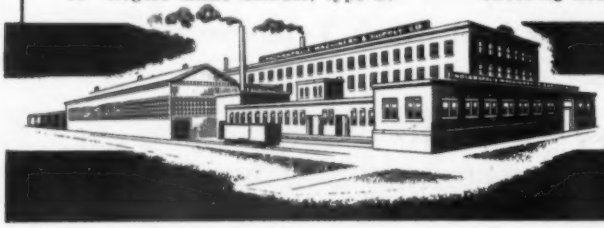

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AUTOMATICS, Cleveland 3½" 4 spdle, Mod. K4
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BORING MILLS, Rockford, 3½" bar, Horizontal, 24x72" table, M.D. & 3½" Universal, M.D.
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LATHES Morey #3 G. A. Turret, M.D.
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MILING MACHINES, Becker Vertical #5 & 6
MILLING MACHNE, Milwaukee #1B Plain & Universal #3B Plain, M.D.
MILLING MACHINES, #2B Rockford Universal
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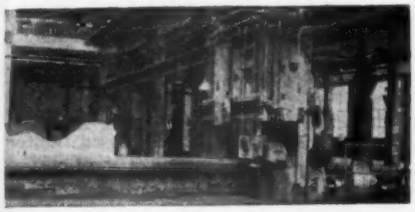

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#2A & #3A Brown & Sharpe Universal, M.D.
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#4B Brown & Sharpe, Plain, M.D.
#4 Milwaukee, Plain, M.D.
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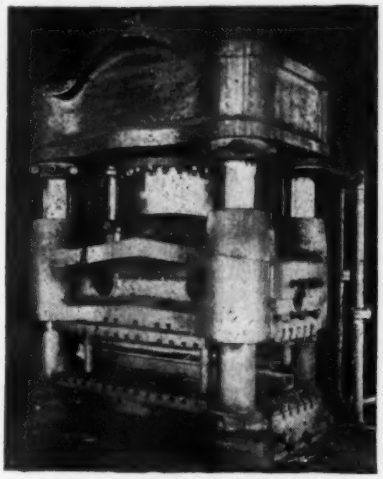

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30"x30"x10' American, 2 heads, belt
30"x30"x10' American, 1 head belt
36"x36"x10' Niles, 2 heads, belt
36"x36"x12' Powell, 2 heads, m.d.
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36"x36"x20' G. A. Gray, 2 heads, m.d.
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No. 3S Cincinnati Acme Full Universal m.d., bar, Timken, latest type
No. 3A Warner & Swasey Univ., m.d., chucking
No. 3A Warner & Swasey Universal, m.d., bar
No. 3 Warner & Swasey Universal Ram Type, m.d., latest type
No. 4 Warner & Swasey Universal Ram Type, m.d., latest type
No. 4B Cincinnati Acme, m.d. in base, bar
No. 4 Warner & Swasey, cone bar
No. 5 Warner & Swasey Universal 12 speed, m.d., bar, latest type
2½x24" Jones & Lamson Geared Head, m.d., bar
3x36" Jones & Lamson Geared Head, m.d., bar
3 spindle 3x36" Jones & Lamson Geared Head m.d., chucking
3½x32" Jones & Lamson Geared Head, m.d., bar
18" Libby Type A Turret Lathe, m.d., chucking
24" Gisholt, cone
26" Libby Type C, m.d. chucking
28" Gisholt, cone
Woods Tilted Turret, model D, cone

HONING MACHINE

No. 2 Barnes Horizontal, m.d., latest type

RADIAL DRILLS

3'—11" Carlton, m.d., on arm, latest type
3'—9" Cinn. Bickford, m.d., on arm, latest type
3' American Sensitive, belt
3' Fosdick Sensitive, belt
3½' Cincinnati-Bickford Plain, m.d.
4'—9" American Hole Wizard, m.d. latest
4'—11" American Hole Wizard, m.d., latest
4'—13" American Hole Wizard, m.d., latest
4' American Triple Purpose, m.d. on arm
4' American Triple Geared, m.d.
4—15" Cinn.-Bickford Super-Service, m.d. on arm
4' Cincinnati-Bickford Plain, m.d. on arm
4' Cinn.-Bickford 13" column, gear box on base
4' Niles-Bement-Pond Semi-Universal, m.d.
5' American Triple Geared, 13" column, gear box
5'—13" Carlton, m.d.
5' Cincinnati-Bickford m.d.
5' Cinn.-Bickford Plate Hole Driller, m.d. on arm
5' Dreses—13"—gear box on base
5' Prentice, m.d.
6'—17" American Hole Wizard, m.d. on arm, latest type
6'—17" American Hole Wizard, m.d. on arm, with road type motor driven base, latest type
6' Niles-Bement-Pond Semi-Universal, m.d.
6' Cincinnati-Bickford Full Universal, m.d.
6' Western 16" column, m.d.
6' Reed-Prentice, m.d.
7' Cincinnati-Bickford, gear box
8' American Triple Purpose, m.d. on arm
10'—22" American Triple Purpose, m.d. on arm
6'—15" Carlton, m.d.

UPRIGHT DRILLS

22" Barnes All Geared Self-Oiling
25" Weigel belt
30" Rich, m.d.
32" Aurora, belt
H3 Barnes Hydram, m.d.
No. 221½ Barnes H.D., m.d.

Partial Listing only. We carry a stock of more than 1200 machines.

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MACHINERY CO
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CLOSEOUTS

BORING MILLS
HORIZONTAL

2½", 4" Binsee
4" Landis Horiz., Floor Type, M.D.

VERTICAL

66", 120" Niles
54" Colburn, M.D., 2 hds.

TURRET LATHES

Foster Nos. 4, 5, 6, 1B, M.D. Univ.
J. & L. 2¼x24", 3¼x36"
Acme 3¼" M.D.

GRINDERS

P. & W. 14", 18", B.B., Vert., M.D.
Blanchard 30", M.D.; Modern 12x48", MD.
Norton Hydraulic 12x18", M.D.
Heald Nos. 55, 70, 72A3 Gagematic, M.D.
Norton 50"x28', M.D.
Landis Type A 6x20" Hydraulic, M.D.
Bryant No. 12, M.D.
Nos. 50, 55, 60 Heald Int. Hydraulic, M.D.
12" Heald Rotary, Arter 12" M.D.
B. & S. No. 2 Surface, M.D.
Norton 10x36" Hydraulic, M.D.
Badger 24" Dbl. Opposed, M.D.
B. & S. No. 10 1' Cyl.
No. 2 Cincinnati, Centerless, M.D.
B. & S. No. 1, 3 Universal

LATHES

McCabe 26-42"x14'
24x12' Boye & Emmes 3 step cone, B.D.G.
20"x14' Rahn-Larmon, raised to 24"
14x6' Hendey
9" LeBlond Automatic
36x30' Putnam, M.D.
36x22' Putnam S.C.G., D.C.M.D.
32"x36' Wickes
Putnam 42x16', M.D.
30x26' L. & S. 12 speed M.D.
P. & W. 1x18, 1¼x18 Automatic Lathes

AUTOMATICS

B. & S. No. 2, 6F Hand Screw
B. & S. No. 00, 0
5 Spdle. Davenport 9/16" cap.
Cleveland Model A ⅛", 5/16", 1¼", 2"
Cleveland Model B 1", 2"
P & J. 6A, M.D.
⅞" Cone 4 spindle

New In Stock

5, 10, 20 ton OBI Power Presses
7" Ammco Shapers
Halco Vertical Milling Heads, Drill Presses
Kalamazoo Metal Band Saw

RADIALS

3', 4', 5', 6', 8' American Triple Purpose
3', 3½', 4', 5' Cincinnati-Bickford
4' Mueller, M.D.; 4', 5' Western, S.P.D.

MILLING MACHINES

10" P. & W. Auto.
No. 3S Cincinnati, S.P.D. rapid trav., M.D.
Nos. 1Y, 0Y, 3, 4, 5 B & S Plain & Univ.
B. & S. Nos. 12, 13, 13B
Hall Planetary Model D Thread Miller
Providence Planer Type 32"x8'
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 3, 4, Cincinnati Vert.
P. & W. No. 12, 30 Profiler, M.D.
No. 4 B. & S. Universal
K. & T., B. & S. No. 2, 3 Dbl. overarm
B. & S. No. 2, 3, Vert.
Milwaukee No. 2½ B Vert.
Kempsmith No. 1 Univ.

MISCELLANEOUS

Gorton No. 1S Engraving Machine
6 spindle Avey Drill, 15" overhang
McCabe ½" Flanger
Rochester No. 5½" B Hammer
Baker #2 Keyseater.5 P.D.
Pels 6" Vert. Shaper
Pipe Machines, 4", 6", 8", M.D.
N.B.P. 15" Slotter, M.D.
#7 Burr Keyseater
Nateo No. 13 Multiple Spindle Drill
48" Southwark gate shear ½" 24" gap.
6' Hilles & Jones Roll

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No. 4 Cincinnati High Power Miller with Turchan follower or duplicating attachment.

No. 2 Cincinnati Medium Speed Dial Type vertical miller.

No. 2 Cincinnati Medium Speed Dial Type plain miller.

2½" capacity No. 7A Jones & Lamson saddle type turret lathe with lot of equipment.

14" Pratt & Whitney hydraulic feed vertical surface grinder with magnetic chuck.

12" Betts Heavy Duty crank slotter.

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BROACH. No. 2S Lapointe hydraulic

BROACH. No. 1 Foote Burt vert. surf. hydr.

BUFFER. No. 40 Standard Elec. NEW.

DRILL. 21" Canedy Otto upright. NEW.

GEAR SHAPERS. Nos. 7 & Z1 Fellows

GEAR HOBBERS. Nos. 16HS & 18H G. & E.

GRINDER. 6"x18" Thompson hydr. surface

GRINDER. 12"x36" Grand Rapids hydr. surf.

GRINDER. 16", No. 10 Blanchard surface

GRINDER. No. 2 Cincinnati centerless

GRINDER. No. 2 Brown & Sharpe univ

GRINDER. No. 72A3 Heald Sizematic Internal.

LATHE. 14"x18" Monarch Magnamatic

LATHE. 15"x22½" Sundstrand automatic stub.

MILLER. No. 1½ Standard Hand. NEW

MILLER. No. 2 Kent Owens Hand.

MILLER. Ingersoll rotary & planer type (11)

SHAPER. 32" Morton draw-cut, M.D.

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#2 Cincinnati Tool & Cutter Grinder
2—#72A Heald Sizematic Grinders
#2 Cincinnati Centerless Grinder
10" x 48" Cincinnati Plain Hydraulic Grinder
14" x 60" Mattison Surface Grinder
#6 Landis Semi-Automatic Grinder

LATHES

24" x12' LeBlond Geared Head Lathe
2—20" x 9' LeBlond Geared Head Lathes
18" x 10' Sidney Geared Head Lathe
16" x 8' Sebastian Geared Head Lathe
16" x 54" Monarch Helical Geared Head Lathe
#12 Gisholt Hydraulic Production Lathe

MILLERS

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4—#2-24 Cincinnati Plain Hydraulic Millers
#2H Milwaukee Plain Miller
4—#2K Milwaukee Plain Millers
2—#1248S Milwaukee Simplex Millers
4—#2H Milwaukee Vertical Millers
#2K Milwaukee Vertical Millers
#4H Milwaukee Vertical Miller
4½" x 36" Pratt & Whitney Thread Miller

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4—#3 Warner and Swasey Universal Geared Head Turret Lathes
5—#5 Warner & Swasey Universal Geared Head Turret Lathes
3—#5 Gisholt Universal Geared Head Turret Lathes
3—#2F Foster Fastermatic Geared Head Turret Lathes
9—#5U Foster Universal Geared Head Turret Lathes
2—#5 Jones & Lamson Universal Geared Head Turret Lathes
2—#8A Jones & Lamson Universal Geared Head Turret Lathes

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Large selection of Drill Presses, small grinders, tools. Machines may be inspected under power. Representative at plant Mondays through Fridays. Partial listing.

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7—#0-8 Cincinnati Plain Automatic Millers, Rise & Fall, Motors.
1—10" x 72" Norton Type C Plain Hydraulic Grinders, A.C. Motor Drive.
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3—#2-20 Kent Owens Hydraulic Milling Machines, A.C. Motor drive.
3—#2 Sundstrand 24" Electo Mills, A.C. Motor drive.
1—#2A Warner & Swasey Air Chuck, Serial Number 620,000, A.C. M.D.
2—#3A Warner & Swasey, Taper, Threading Etc. Serial 649000 A.C. M.D.
1—#4A Warner & Swasey, Threading, Chuck. Serial 649000 A.C. Motor.
1—#5 Warner & Swasey Universal Turret Lathe, Air Chuck, Serial 620000 A.C. M.D.

BORING MILLS

36" & 42" Bullard New Era Vertical Turret Lathes, A.C. M.D.
12' Niles Bement Pond Vertical Boring Mill, 2 Heads, Geared Feeds. D.C. Drive.
42' Niles 2 Head Boring Mill, reasonably priced.

LATHES

16" x 8' Hendey Cone Head, Q.C.
18" x 8' Lodge & Shipley 3 S.C.D. Lima Drive, Q.C
18" x 8' Lodge & Shipley Grd Head. Taper, A.C. M.D.
25" x 12' LeBlond Grd. Head, A.C. Motor drive, Taper.
27" x 16' Lodge & Shipley Geared Head, A.C. M.D. Taper
36" x 30' Lodge & Shipley Geared Head, Two Carriages, Q.C.

MILLING MACHINES

#3 Cincinnati Vertical H.P. S.P.D.
#4 Cincinnati High Power, A.C. M.D. Rapid Traverse, Vertical.
#5 Cincinnati Rect. Overarm, Rapid Traverse, S.P.D.
#4A Brown & Sharpe Universal, S.P.D.

GRINDERS

16" x 50" Hill Clarke, A.C. M.D.
18" x 85" Landis Crankshaft.
#78 Covel Hanchett Surface.

PLANERS

60" x 48" x 24' American, 4 Heads.
24" x 24" x 10' Powell Planer, 2 Heads.

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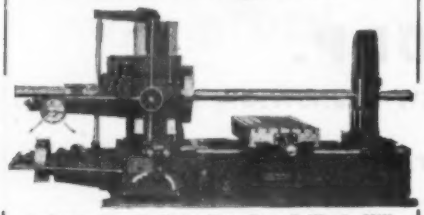


1—Lucas No. 33 Prec. Hor. Bor. Drill. & Mill. Mach., dia. spin. 4½", No. 6 Morse taper, spin. trav. 52", max. dia. face plate to outer support 6' max. dis. top tbl. to spin. center 30", size tbl. 30" x 56", 18 speed changes, M.D.

1—Giddings & Lewis Knee Type No. 0 Horz. Bor. Mill, diam. spin. bar 3⅛", Morse taper No. 5, long. trav. 20", vert. adj. 25½", max. dist. tbl. to spin. cen. 20", dist. face spin. to bor. bar support 84", tbl 23¾" x 45", M.D.

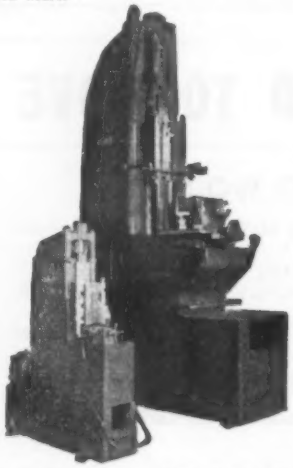
1—Univ. 3½" Knee Type Boring Mill, 3½" bar, No. 6 Morse taper, size of tbl. 30" x 48", cross feed to tbl. 30", long. 56, vert. 30" no. spin. speeds 16, max. dist. face plate to outer support 84".

1—Niles No. 72, Duplex Control Horz. Boring, Drilling and Milling Machine, M.D., Excel. condition, spin. diam. 4½", spin. trav. sin. 30", dbl. 60" max. hght. cent. to tbl. 36", max. dist. spin. end to outboard bearing 84", tbl. lgth. 60", width 33", long. trav. 45½", trans. trav. 48".

Bullard 24" Rapid Production Vert. Bor. Mill. capac. with side hed. diam. 26", hght. 18", 26½" under turret face, diam. tbl. 24½", 15 tbl. speeds, 8 feed changes, vert. movement, vert. head 18", will face 32".

2—Bullard 42" Vert. Boring Mill, capac. 44" diam., 33" under cross rail 43½" under turret face, 42⅝" tbl. diam, with 3 jaw com, chuck built-in table, 12 tbl. speed changes 3.3 to 56 RPM, 8 pos. indpdt. feed changes for each hed., vert. hed. move .27", will face 44", turret diam. 16¾" 5 faces 2¾" holes, side hed. vert. move. 25", horz. 21" top tbl. to underside side hed. slide 25".

1—Landis 1½"-4" sin. head lead screw type Bolt Threader, M.D., silent chain drive, comp. with stan. roty. die head, auto. opening and closing for die head, lead screw, carriage tr. 28", 7½ HP, AC motors and controls, very late type, used few hundred hours.



Cin. No. 2-36 Sin. Ram Vert. Hydro-Broaching Machine, M.D. Serial No. 1EOZ-1H-3336496, very late type, max. stroke of ram 36", tbl. wkg. surf. 13" x 19¾, broach force exerted 5000 lbs. comp. with AC elect. equip. used but few hundred hours.

American Tool Works Co. 24" x 25' grd. hed, QCG M.D. Engine Lathe, with pan bed, extra carriage for boring attmt. with rapid trav., dist. betw. centers 21'". Excellent condition. Priced right.

1—Amer. 24" x 8', grd. head, QCG med. pattern Eng. Lathe, arr. for grd. M.D., Ser. No. 44873, sw. over ways 24½", dis. bet. centers 46", No. 4 Morse taper.

1—Edlund 3B 12", 4 spin., individual motors to each spin., No. 2 Morse taper. 220/3/60 electric equip.

Leland-Gifford No. 2 Motor Spindle Drill, 14" overhang, range of speeds 600-1800 RPM. 220/3/60.

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AIR HYDRAULIC PRESSES: (New) 5 Ton, 2"-5" Stroke
AUTOMATICS: (2) Gridley Single Sp. 3¼", 4¼" Cap.
(2) Davenports 5 Sp. 9/16" Cap. Model No. 24
Br. & Sh. No. 4 (1½") Hi Speed
Vert. Bullard Mult-au-matic D 6 Sp. 12" Cap. 1941
B & S #00G Hi Speed
BORING MILLS: Her., Gisholt 4"
Bullard V.T.L. 36" (1941) Hi-Speed
Bullard V.T.L. 24" (1940) Hi-Speed
DRILLS: (2) Avey #2, 1 & 2 Spindle, 12" overhang 1940
#3 Leland Gifford 1 Spindle 4 speed mot. (1941)
GEAR GENERATOR: 18" Gleason, Str. & bevel, segments
DRILL PRESS: 36" overhang #4 Morse
GRINDERS: Covel Model No. 91A Un. Tool & Cutter (1944)
Thread, Excello No. 31 (1941)
Thread, J & L 8" x 48" (1941) x 6" x 16"
Double End, Norton, Model D
B & S. No. 2 Univ. Cylindrical 14" x 30" (1941)
Chucking, Bryant No. 16, like new (1943)
Int. Heald 72A3 Sizematic (1941)
Plain Cyl. Landis 4" x 12" Hyd. (1943)
Surface Abrasive #3B (1941) #1½B
Vertical Surface Abrasive #33 (1935)
Pl. Cyl. Norton Type C Hyd. 10" x 18" (1940)
Univ. Cyl. Br. & Sh. #2, 14 x 30", (1941)
Int. Bryant #16 x 28", Two—(1940) (1943)
LATHES: Adams Short Cut Geared Head 14" x 4' Speed, Sloan & Chase, collets Bench type.
Lodge & Shipley 16" x 6', Quick Change, Taper (1941)
Engine, Lodge & Shipley Sel. g.h. 30" x 12' mot.
Stub, Sundstrand, Auto 8" x 15", Type D (1941)
Lodge & Shipley 16"/20" x 30" Cent. Turret Att. (1941)
Monarch 16" x 30" Keller Attach. (1941) Also 14"
Monarch 12" x 30" raised to 18" swing (1941) dble compound
(2) Regal LeBlond 19" x 8' (1943)
MILLERS: Milwaukee #2 Universal Q.C.
Plain Horiz. No. 3 LeBlond, Vert. Att.
Plain, Garvin No. 14 (like No. 2)
Vert. Cinc. #3M.S. plus 20" Rotary Table (1941)
Vert. Milwaukee #3K plus 20" Rotary Table (1941) also #2
Duplex Automatic Sundstrand 24" Index Table & station Rigidmill (1941)
Vert. Cinc. #2 with 16" rotary table constant
Plain-Milw. #2H & #3 (1940)
Vert. Cinc. #2 & #3 (1940)
PIPE: Cut-Off 3" Hurlbert-Rogers
Portable Threader & Cut-off 2" cap.
POWER PRESSES: Perkins Jr. Special Hopper Feed, 10 others
Bliss #37½-50 ton, S.S., 1½" Stroke, geared
PROFILER: Morey 2 Spindles (1943)
PLANER: Cinc. 36" x 30" x 10' 2 hds. rail mot.
RADIAL DRILLS: Cinc. Bickford 2½' x 7½" Rd. Col. (1941)
Sterling Drillmaster #18 mot. (1944)
Carlton 3' x 9" also 11" col. (1940)
Morris 3' x 9"
RIVETER: Counter Sinker Farnham, hyd. (1944) 36" Reach
SAWS: Band, Kalamazoo, Metal (NEW) 8" x 16"
SLOTTER: Vert. Bement Niles—12"
SHAPERS: Steckbridge 24" b.g. mot. H.D.
G. & Eb. 24" H.D. mot.
SHEAR: Pels T36 eye beam 4" angles H.D.
SLOTTER: Vert. Bement Niles-12"
TAPPERS: (10) Horiz. Richert Shaffer ⅜" mot.
THREAD MILLERS: Plan-o-Mill 8" Int. Ext x 31" long (1943)
TURRETS: J & L #5 (1941)
Midland #5 Universal (1943) Bar & chucking
W. & S. No. 2 Mot. in base (1941)
Gisholt No. 2L Mot. in base (1941)
W. & S. #4 Univ. (1940) also #2, #5
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Drill, Sipp. 2 Spdle, H.S. Sensitive 8" overhang.
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15 HP Mtr. arr. Wet Grinding, excellent cond.
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TIMKEN BEARING—MOTOR DRIVEN

3 phase 60 cycle 220-440 volt

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LUCAS No. 42, 4" bar Hor. Boring Mill Mill
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MONARCH 14"x30", 14"x54", 18"x72" between centers, 16-speed head Lathes
LODGE & SHIPLEY 16"x72" between centers, 12-speed head Lathe
LeBLOND 18"x72" between centers, 16-speed head Lathe
MOREY No. 2G Turret Lathe, 1" cap.
MOREY No. 3, 1½" cap., No. 4, 2" cap. Univ. Turret Lathes
AMERICAN Hole-Wizard 4', 5' Plain Radial Drills, 11" column
THOMPSON 24" wide, 96" table Surface Grinder
B & S No. 3 Univ. Grinder
MILWAUKEE Nos. 2H, 3H Plain Millers
MILWAUKEE No. 2H Univ. Miller
VAN NORMAN Nos. 12, 26 Univ. Millers
P & W 4½"x12" Thread Miller, Model C
MOREY-SHIELDS 12"x60" Thread Miller
CINCINNATI No. 3 Ver. Miller
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MOREY 8", 12" Ver. Shapers

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Class 1, Practically New
Overhead Traveling Cranes—15 T, 22 T and 25 Ton Capacity
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1—78½ Bliss Trimming Press
1—42x42x12 Planer Type Milling Machine, 3 Heads—Adjustable Rail
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ADVERTISERS INDEX

	Page
Abbott Ball Co.	196
Abrasive Co.	309
Abrasive Machine Tool Co.	246
Acme Aluminum Alloys, Inc.	160
Acromark Co.	306
Allen-Bradley Co.	205, 206
Allen Manufacturing Co.	194
Allied Products Corp.	184
Allis-Chalmers Manufacturing Co.	17, 32
Almond Mfg. Co., T. R.	302
Aluminum Co. of America	59, 67
American Chain & Cable Co., Inc.	232
American Cutter & Engineering Corp.	302
American Gauge Co.	320
American Laundry Machinery Co.	228
American Metal Hose Branch Anaconda Copper Mining Co.	193
American Swiss File & Tool Co.	308
American Tool Works Co.	16
Ampco Metal, Inc.	158
Ampco Twist Drill Co.	132
Angier Corp.	216
Anton Machine Works	285
Apex Machine & Tool Co.	249
Armstrong-Blum Manufacturing Co.	46
Armstrong Brothers Tool Co.	45
Arter Grinding Machine Co.	250
Atkins & Co., E. C.	293
Atlas Press Co.	238
Automatic Machine & Tool Co.	296
Avey Drilling Machine Co.	227
Bakelite Corp.	173
Baker Brothers, Inc.	229
Baldwin Southwark Div., Baldwin Locomotive Works	218
Bantam Bearings Div., Torrington Co.	201
Barber-Colman Co.	71
Bardons & Oliver, Inc.	58
Barnes Co., W. F. & John	243
Barnes Drill Co.	241
Barrett Co., Leon J.	322
Baumbach Manufacturing Co., E. A.	224
Baush Machine Tool Company	244
Beaver Gear Works, Inc.	214
Behr-Manning Corp.	283
Bethlehem Steel Co.	265
Bilgram Gear & Machine Works	210
Black & Decker Manufacturing Co.	155
Black Manufacturing Co.	311
Blake Co., Edward	328
Blanchard Machine Co.	85
Blank & Buxton Machinery Co.	192
Bokum Tool Co.	304
Boyar-Schultz Corp.	321
Braun Gear Co.	212
Breuer Electric Manufacturing Co.	328
Brown & Sharpe Mfg. Co.	81
Bryant Chucking Grinder Co.	84
Bryant Machinery & Engineering Co.	263
Bullard Co.	73
Bunting Brass & Bronze Co.	209
Burke Machine Tool Co.	246
Cadillac Gage Co.	137
Campbell Div., Andrew C., Amer. Chain & Cable Co., Inc.	232
Carboloy Co., Inc.	149
Card Manufacturing Co., S. W.	302
Carlton Machine Tool Co.	250
Century Electric Co.	189
Chicago Screw Co.	200
Chicago Wheel & Mfg. Co.	156
Cincinnati Bickford Tool Company	87
Cincinnati Electrical Tool Co.	322
Cincinnati Gear Co.	216
Cincinnati Grinders, Incorporated	10, 11
Cincinnati Lathe & Tool Co.	250
Cincinnati Milling Machine Co.	4, 5
Cincinnati Planer Co.	44
Clearing Machine Corp.	223
Cleerman Machine Tool Co.	263
Cleveland Crane & Engineering Co.	217
Cleveland Pneumatic Tool Co.	291
Cleveland Twist Drill Co.	287
Colonial Broach Co.	139
Columbus Die Tool and Machine Company	220
Cone Automatic Machine Co.	35
Consolidated Machine Tool Corp.	61
Continental Tool Works, Div. of Excello Corp.	49
Cortland Grinding Wheels Co.	301
Coulter Machine Co., James	258
Crafts Co., Inc., Arthur A.	320
Criterion Machine Works	296
Cunningham Co., Co., M. E.	330
Curtis Pneumatic Machinery Co.	329
Danly Machine Specialties, Inc.	220
Davis & Thompson Co.	224, 310
Davis Keyseater Co.	254
Dayton Rogers Mfg. Co.	296
Dayton Rubber Mfg. Co.	197
Dearborn Gage Co.	153
Desmond-Stephan Mfg. Co.	304
Detroit Bevel Gear Co.	214
DeVlieg Machine Co.	52
DoAll Co.	289
Douglas Machinery Co., Inc.	248
Dykem Co.	320
Earle Gear & Machine Co.	212
Eastern Machine Screw Corp.	330
Elgin National Watch Co.	323
Empire Bronze	330
Empire Tool Co.	257
Errington Mechanical Laboratory	308
Etna Machine Co.	225
Ettco Tool Co.	236
Excello Corp.	28, 29
Executone, Inc.	248
Famco Machine Co.	220
Farrel-Birmingham Co., Inc.	213
Fawick Airflex Co., Inc.	261
Federal Machine & Welder Co.	316, 317
Federal Telephone & Radio Corp.	286
Fellows Gear Shaper Co.	8, 9
Fish Research & Engineering Co., J. R.	294
Fitchburg Grinding Machine Corp.	72
Fitzsimmons Co.	175
Ford Motor Co., Johansson Div.	273
Fosdick Machine Tool Co.	34
Fostoria Pressed Steel Corp.	326, 327
Gairing Tool Co.	267
Gallmeyer & Livingston Co.	242
Ganschow Gear Co.	212
Gates Rubber Co.	171
General Electric Co.	33, 63, 68
General Engineering & Mfg. Co.	246
General Machinery Corporation	70
Geometric Tool Co.	330
Gerotor-May Corporation	186
Giddings & Lewis Machine Tool Co.	50, 51
Gisholt Machine Co.	27, 53
Gleason Works	3
Gorton Machine Co., George	235
Goss & deLeeuw Machine Co.	254
Graham Mfg. Co.	330
Grant Gear Works	216
Grant Mfg. & Machine Co.	222
Gray Co., G. A.	80
Gray-Mills Co.	185
Grobet File Corp.	304
Gulf Oil Corp.	75
Hamilton Tool Co.	246
Hammond Machinery Builders	251
Hanchett Manufacturing Co.	234
Hardinge Brothers, Inc.	39
Hartford Special Machinery Co.	210, 310
Haskins Co., R. G.	161
Heald Machine Co.	2nd Cover
Hedstrom Corp., Oscar W.	170
Hobart Brothers	330
Hoefer Mfg. Co.	276
Holman Reamer Co.	310
Hones, Inc., Charles A.	330
Hovis Screwlock Co.	219
Howell Electric Motors Co.	181
Hyatt Bearings Div., General Motors Corp.	182
Independent Pneumatic Tool Co.	54, 55
Ingersoll-Rand Co.	275
International Nickel Co., Inc.	169
International Telephone & Telegraph Corp.	286
J & S Tool Co.	320
Jack & Heintz, Inc.	168
Jacobs Manufacturing Co.	280, 281
Jones & Lamson Machine Co.	6, 7
Kaufman Manufacturing Co.	300
Kaydon Engineering Corp.	188
Kearney & Trecker Corp.	42, 43
Kelley Gear & Tool Co.	214
Kempsmith Machine Co.	83
Kennametal, Inc.	41
Kent-Owens Machine Co.	239
Kester Solder Co.	292
Kingsbury Machine Tool Co.	66
Knight Machinery Co., W. B.	254
Koebel Diamond Tool Co.	308
Kropp Forge Co.	179
Kux Machine Co.	224
Lakeside Engineering Works	254
Landis Machine Co.	14, 15
Landis Tool Co.	18, 19
LaPointe Machine Tool Co.	231
LeBlond Machine Tool Co., R. K.	74
Lee Co., K. O.	252
Lehmann Machine Co.	247
Leland-Gifford Co.	240
LeMaire Tool & Mfg. Co.	172
Lempco Products, Inc.	31
Liberty Planers, Inc.	248
Lincoln Electric Co.	36, 37
Linley Brothers Co.	232
Lodge & Shipley Machine Tool Co.	135
Logansport Machine Co., Inc.	313
Lovejoy Tool Co., Inc.	325
Luers, J. Milton	310

ADVERTISERS INDEX

	Page
McCaskey Register Co.	162
McCrosky Tool Corp.	141
McGraw-Hill Book Co., Inc. 262, 268, 288, 300, 321, 328, 329, 331	
McKiernan-Terry Corp.	228
Mallory & Co., Inc., P. R.	208
Marlin-Rockwell Corp.	187
Masonite Corp.	167
Mattison Machine Works	230
Mead Specialities Co.	196
Meisel Press Mfg. Co.	212
Metro Tool & Gage Co.	299
Michigan Broach Co.	180
Micromatic Hone Corp. 76,	77
Midvale Co.	48
Mid-West Abrasive Co.	26
Miller-Knuth Mfg. Co.	330
Millholland Machinery Co., W. K.	240
Mitts & Merrill	252
Moline Tool Company	240
Monarch Machine Tool Co. 24,	25
Monarch Steel Co.	175
Moore Special Tool Co.	164
Morey Machinery Co., Inc.	242
Morris Machine Tool Co.	90
Morse Chain Co.	207
Morse Twist Drill & Machine Co.	269
Mullins Mfg. Corp.	190
Murray Mfg. Co., D. J.	232
National Acme Co.	65
National Broach & Machine Co.	30
National Lock Washer Co.	196
National Machine Tool Co.	306
National Twist Drill & Tool Co.	279
Nelco Tool Co., Inc.	278
Newark Gear Cutting Machine Co.	210
New Britain-Gridley Machine Div. New Britain Machine Co. 3rd	Cover
Nicholson & Co., W. H.	322
Nicholson File Co.	163
Nilson Machine Company, A. H.	222
Noble & Westbrook Mfg. Co.	170
Norgren Co., C. A.	192
Norma-Hoffmann Bearings Corp.	199
Norton Co. 22, 23,	86
Nu Products Co.	292
Oakite Products, Inc.	270
Ohio Crankshaft Co.	165
Ohio Machine Tool Co.	260
Oliver Instrument Co.	252
O'Neil-Irwin Mfg. Co.	222
Osborn Mfg. Co.	166
Oster Manufacturing Co.	237
Parker Appliance Co.	315
Parker-Kalon Corp.	176
Philadelphia Gear Works, Inc.	211
Pioneer Pump & Mfg. Co.	194
Pope Machinery Corp.	303
Portage Machine Co.	242
Potter & Johnston Machine Co.	79
Pratt & Whitney Div., Niles-Bement-Pond Co.	82
Process Gear Co.	214
Production Machine Co.	252
Producto Machine Co.	224
Quaker City Gear Works, Inc.	210
Quality Tool & Die Co.	256
Randall Co., Frank E.	292
Ready Tool Co.	262
Reed-Prentice Corp.	252
Reed Small Tool Works	282
Reliance Hydraulic Press, Inc.	226
Revere Copper & Brass, Inc.	147
Reynolds Metals Co., Aluminum Div.	177
Rivett Lathe & Grinder, Inc.	40
Roberts Rubber Co., Weldon	307
Ruthman Machinery Company	170
Ryerson & Sons, Inc., Joseph T.	154
S.K.F. Industries, Inc.	178
Scherr Co., Inc., George	20
Sellers & Co., Wm.	233
Seneca Falls Machine Co.	259
Sheffield Corp.	159
Shore Instrument & Mfg. Co., Inc.	292
Sier-Bath Gear Co., Inc.	215
Simonds Worden White Co.	21
Simplex Engineering Company	69
Sinclair Refining Co.	62
Sisalkraft Co.	200
Smith Corporation, A. O.	314
Smith & Mills Co.	212
Snyder Tool & Engineering Co.	64
Socony-Vacuum Oil Co., Inc.	297
Sossner Co.	266
South Bend Lathe Works	56
Springfield Machine Tool Co.	240
Stahl Gear & Machine Co.	214
Standard Conveyor Co.	150
Standard Oil Co. (Indiana) 271,	272
Standard of California	312
Standard Pressed Steel Co.	183
Star Electric Motor Co.	203
Steelweld Machry. Div. Cleveland Crane & Engineering Co.	217
Strand Co., N. A.	310
Strong, Carlisle & Hammond Co.	202
Stuart Oil Co., Ltd., D. A.	284
Sundstrand Machine Tool Co.	255
Sun Oil Company	151
Super Tool Co.	295
Thompson Grinder Co.	47
Threadwell Tap & Die Co.	305
Timken Roller Bearing Co.	78
Steel & Tube Div. 4th	Cover
Tool Improvements Co.	308
Torrington Co. 145,	220
Torrington Co., Bantam Bearings Division	201
Trabon Engineering Corp.	174
Tubular Micrometer Co.	282
Tungsten Electric Company	277
Turner Gauge Grinding Co.	152
Tuthill Pump Co.	202
Union Carbide & Carbon Corp.	173
Union Twist Drill Co.	60
U. S. Drill Head Co.	322
United States Products Co.	304
Universal Boring Machine Co.	254
Universal Engineering Co. (Mich.)	290
V & O Press Co.	224
Van Keuren Co.	57
Van Norman Co. 12,	13
Veeder-Root, Inc.	195
Vickers, Inc.	157
Victor Machinery Exchange, Inc.	284
Victor Saw Works	260
Vinco Corporation	298
Vitrified Wheel Co.	306
Wade Tool Co.	253
Waldes Koh-I-Noor, Inc.	204
Walker Co., Inc., O. S.	276
Wall-Colmonoy Corp.	198
Walsh Press & Die Co.	221
Waltham Machine Works	258
Warner & Swasey Co.	88
Warren City Manufacturing Co.	319
Weatherhead Co.	191
Webber Gage Co.	130
Weldon Tool Co.	288
Wells Mfg. Corp.	264
Westinghouse Electric Corp.	38
Wheelock, Lovejoy & Co., Inc.	202
White & Bagley Co.	282
Willson Products, Inc.	331
Wilson Machine Products Co.	143
Wilson Mechanical Instrument Co.	306
Woodworth Co., N. A.	274
Worthington Pump & Machinery Corp.	318
Wyzenbeek & Staff, Inc.	300
Yoder Company	245
Zeh & Hahnemann Co.	222

SEARCHLIGHT SECTION

Classified Advertising

Classification	Page
AUCTION	336
BUSINESS OPPORTUNITIES	334
CONTRACT WORK SECTION 332,	333
All Tool Co.	333
American Tool Co.	333
Barrett Machine Tool Co.	333
Bridgewater Screw Products Co.	332
Buxton Co., John L.	332
Eastern Tool & Mfg. Co.	332
General Pattern Works	332
Greist Mfg. Co.	332
J. & S. Tool Co.	332
M & N Machine & Tool Works	333
Morhardt & Co., Chas.	332
Nilson Machine Co., A. M.	332
Precision Parts, Inc.	332
Production Tool Co.	332
Reliance Industries, Ltd.	332
South Shore Machine & Tool Works	333
Specialty Machine Tool & Die Co., The	333
Thomas & Skinner Steel Products Co.	332
Vahl Engineering Co.	332
Wayne Mfg. Co.	333
EMPLOYMENT SERVICE	334
PATENT ATTORNEY	334
POSITIONS VACANT 333,	334
POSITIONS WANTED	334
REBUILDING SERVICE	338
Hill-Clarke Machy. Co.	338
SELLING OPPORTUNITIES 334,	335
WANTED TO PURCHASE	335
USED EQUIPMENT 335-	346
Aaron Machinery Co. 338, 340, 342,	344
Botwinik Bros. of Mass. Inc.	346
Briggs Clarifier Co.	336
Brooks, B. D.	336
Brownell, Hazard	338
Cincinnati Machinery & Supply Co.	345
De Witt Tool Co.	335
Dony Machinery Co., D. E.	338
Eastern Machinery Co.	344
Eastern Tool & Mfg. Co.	335
Emerman Machinery Corp.	343
Falk Machinery Co.	337
Graff Machine Tool Co.	338
Hasco Machinery Co.	342
Hill-Clarke Machinery Co.	338
Howarth & Co., John D.	340
Hyman & Son, Joseph	340
Indianapolis Machinery & Sup. Co., Inc.	340
Industrial Plants Corp.	338
Iron & Steel Products, Inc. 335,	340
Kings County Machy. Exchange	346
Koontz, H. J. 335,	346
Lakeshore Machy. & Supply Co.	346
Lucas & Son, Inc., J. L.	346
Miles Machinery Co., Inc.	344
Mills Machinery Sales	335
Morey Machinery Co., Inc. 339, 340, 343,	346
OK Machine Co. 335,	342
Osborne & Sexton Machinery Co.	340
Ott Machinery Sales, Inc.	342
Paul's Motor & Machy. Supply	340
Reconstruction Finance Corp.	341
Reynolds Machinery Co.	338
S & S Machinery Co.	340
Tri Machine & Tool Co.	336
United Machinery & Tool Corp.	338
United Pipe & Supply Co.	346
Universal Hydraulic Machy. Co.	335
Universal Tool Co.	335
Utility Elevator Service	336
Vermont Marble Co.	336
Vulcan Bearing Machine Co.	336
West Penn Machine Co.	343
Zeeve & Co., Alex.	342

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